THE

GEOGRAPHICAL MAGAZINE.

AUGUST, 1877.

THE ARCTIC EXPEDITION.

XVII.

Refutation of the Assertions of Hostile Critics.

In our previous numbers we have completed our review of the labours of the Arctic explorers of 1875-76. We have told how, thanks to the consummate seamanship of Sir George Nares, the two ships were forced up the ice-laden channels leading from Smith Sound, until they crossed the threshold of the unknown region, and wintered further north than explorers had ever wintered before. We have established the fact that the autumn travelling of the 'Alert' excelled all that had ever been done previously with sledges in that season of the year. We have described the obstacles overcome by the extended parties in the spring, and the terrible hardships they encountered. We have recorded how, in spite of all difficulties, in spite even of the outbreak of scurvy, those parties achieved satisfactory results, including the discovery of 300 miles of new coast-line, and how one party reached the most northern point ever attained by any human being. We have enumerated, in detail, the admirable work of the auxiliary sledge parties;* and have pointed out the chief scientific results of the Expedition. We have also discussed the circumstances of the unexpected outbreak of scurvy, and indicated its true cause.† Finally, we have placed on permanent record the hearty welcome which the explorers received on their return, not only from members of their own profession, but from all classes of their countrymen; and the cordial appreciation with which their discoveries have been received by geographers in all parts of the world.‡ We have, in the course of this review of the work, proved, by a comparison of facts and figures,§ that the Arctic Expedition of 1875-76 was the most successful that ever left the shores of England, and that the amount of valuable work achieved by it, in the face of the most appalling hardships and difficulties, has never been equalled. The success of the Expedition was absolutely complete, and all that not only can be done, but that real geographers ever wished to be done, has been achieved in the direction of Smith Sound.

We now have a less agreeable duty to discharge. Before proceeding to the discussion of the next Arctic work that should be undertaken, it is necessary to place on record the story of the detractors and the backbiters. We shall have to notice the method of their attack, its utter groundlessness, and the persistency with which it has been maintained. For several months we treated it with silent contempt; but at last we came to the conclusion that constantly repeated assertions, however false, if uncontradicted, are calculated to be mischievous, although the mischief can only be temporary. We, therefore, decided upon answering every attack and exposing every erroneous statement that was published having reference to the work of the Arctic Expedition. This was done in our two articles on "Moral Scurvy,"* and in our examination of the Report of the Scurvy Committee.†

In our present article we intend to expose the whole wretched business, from beginning to end, from the first snarl that made itself heard, almost before the gallant explorers had put foot on shore, to the chorus of gratified spite which followed the publication of the Scurvy Committee's Report. It is an old story. Writers of the same stamp reviled Parry and Ross and Austin, and all the best among our former explorers. They accused David Bruce of lying, and broke the heart of Middleton. Yet the fame of the great Englishmen of previous generations remains untarnished, while the very names of those who strove to injure them are utterly forgotten. So will it be again. Our object in reviewing the unfounded accusations of hostile critics is not to gratify their thirst for notoriety, and we shall refrain from mentioning any names. Our intention is to point out, for remembrance hereafter, the sort of reception that every great explorer must count upon from a certain rancorous class of writers, the successors of Dobbs of Castle Dobbs,‡ and of other forgotten detractors of the last century.

The discovery ships had not been two days in Portsmouth Harbour, before a letter appeared in the *Times*, in large type, asserting that the causes of the outbreak of scurvy were not far to seek, for that the pemmican was salted, and the allowance of grog for the travelling parties was doubled. Both statements

* Numbers for June and July 1877.
† See our number for January 1877, p. 3.
‡ Number for January 1877, p. 5, and for April 1877, p. 88.
§ See our number for December 1876, pages 314 to 324.

* Numbers for April and May 1877.
† Number for June 1877, p. 145.
‡ The reviler of Captain Middleton, a gallant explorer of the last century, who discovered Wager River and Repulse Bay. Sir Edward Parry afterwards fully vindicated the memory of Captain Middleton.

were untrue; but the letter served its purpose. It was dirt, and some of it might stick. The next attack was more elaborate and persistent. It was printed in a medical publication called *The Sanitary Record;* but slips were sent round, and obtained insertion in the daily papers. It consisted of three statements, namely, that no lime-juice was sent on the sledges, that the men were expected to drag 420 lbs. each, and that the officers in charge of travelling parties neglected their instructions. All three statements were untrue. Lime-juice was taken on all sledges after the end of April; but not by parties leaving the ship in March or April, because in those months it could not have been used, as every Arctic traveller knows. Out of the twenty sledging parties which left the 'Alert,' eleven took regular daily rations of lime-juice. No man was ever called upon to drag more than 240 lbs., and that only on the first day, this weight being the same as was adopted by McClintock in 1853. As for the assertion that the officers of sledges neglected their instructions, it is a pure invention. The above answers to these three groundless assertions were published; but this had no effect, for their promulgator declared that he was possessed of special sources of information, and, with great effrontery, he continued to repeat his assertions with further embellishments. Then they were taken up by other newspapers, out of heedless ignorance, and so the dirt began to stick. Those who had accepted the statements as true were committed to them, some willingly, others not without reluctance, while the best portion of the press reserved its judgment.

Now comes the worst feature of this discreditable business. The *Sanitary Record* began to print extracts from the journals of the officers who commanded sledge parties, with the object of propping up the allegations already made, and of insinuating further causes of complaint. These journals had not been published, and were still treated as confidential by the Admiralty; consequently they were obtained by the *Sanitary Record* surreptitiously, and in an improper manner. This can only have been done through the connivance of an official in the Admiralty, who was in reality instigating the attack on Sir George Nares, and using the *Sanitary Record* for that purpose. The *Standard*, one of the papers which has always taken a just view of the question, has pointed out the evident malignity of this official, and that there can be very little doubt as to his identity.

Replies to this attack, in the form it then took, were sent to the *Times*, the *Pall Mall Gazette*, and other papers. It was explained that the statements in the *Sanitary Record* to the effect that no lime-juice was taken on the sledges, that the men had to drag 420 lbs. each, and that the officers neglected their instructions, were untrue. It was also shown that the cause of the outbreak of scurvy was not the absence of lime-juice on the sledges, for the following reasons: In the first place there were cases of scurvy among men who never left the ship, or who had gone away travelling at a time when daily rations of lime-juice were regularly issued. Secondly, no extended sledge parties, in previous expeditions, ever took lime-juice, and none were disabled by scurvy. It was further pointed out that lime-juice, in the form in which it was supplied to the ships, namely in jars or bottles, could not have been used in an Arctic March or April, if it *had* been taken.

But the detractors were quite unscrupulous, and were equal to the occasion. Two leading articles appeared in the *Times*, in which it was boldly asserted that lime-juice *was* taken by extended parties in previous expeditions; and that there was no case of a man suffering from scurvy in the late Expedition who had taken lime-juice without intermission.* In vain Admirals Ommanney and Richards wrote to tell the *Times* that they never did take daily rations of lime-juice in Arctic travelling. In vain Dr. Scott assured the revilers that lime-juice was never taken on the sledges, and never wanted in the expedition of 1852-54 when the longest journeys were made. The *Sanitary Record* and its followers continued to persist in their misrepresentations, on the principle that some of their dirt would stick.

Then a further embellishment was added. It was given out that Captain Nares had disobeyed positive instructions to supply all sledge parties with daily rations of lime-juice, and that by so doing he had wilfully caused three deaths, and risked the lives of all under his command. He received no such instructions. He was supplied with many suggestions—some wise, others foolish; but all arrangements were left absolutely to his own discretion, and he very properly followed the precedents established by former experience. He did what Sir Leopold McClintock, or any other experienced Arctic traveller, would have done under the same circumstances.

The object of all this abuse was that the question might be prejudged; that those who had committed themselves to an unfavourable view might become too prejudiced to be able to weigh the evidence impartially when it became accessible. And this was the effect. The production of the evidence was too long delayed. The friends of Arctic exploration were anxious that a Committee should investigate the history of the outbreak of scurvy, in order that all new experience might be thoroughly utilised, with a view to avoiding a similar calamity in future expeditions. The revilers in the press also clamoured for a Committee, but with a very different object, namely, "to satisfy the public"—in other words, to gratify their own malice, or to get their unfounded accusations confirmed.

We have already reviewed the Report of the Committee.† It is quite unnecessary to discuss the possible causes of the decisions that were arrived at. It is sufficient that these decisions were in direct opposition to the body of evidence that was put on record. The evidence conclusively and finally disproved all the malignant accusations that had been made against Sir George Nares. The Report of the Committee virtually confirmed them, and consequently

* There were three such cases, namely, those of James Shepherd in the 'Discovery,' and of George Burroughs and George Kemish in the 'Alert.' Others were attacked who, though they had been away for a few days without lime-juice, returned quite well and had no sign of scurvy until after they had resumed their daily rations of lime-juice for several days—in one case for six weeks. These were Berrie, Dominic, Stuckberry, Smith, Ellard, and Petersen. Others were attacked while away travelling, though taking full daily rations of lime-juice, namely, Captain Feilden, Lorimer, Woolley, and Frederick the Eskimo.

† See our number for June 1877, p. 145.

received unbounded praise from the detractors. The evidence was ignored, while the Report was held up as a model of wisdom and accuracy.

The Report attributed the outbreak of scurvy to the absence of lime-juice from the sledge dietaries, and declared the orders of Sir George Nares for provisioning the sledges to have been improper. The evidence proved that the absence of lime-juice was not the cause of the outbreak of scurvy, and that the arrangements of Sir George Nares were in accordance with the best former precedents.

This Report was surreptitiously and improperly supplied to the *Sanitary Record* through the same malignant agency that had originally promulgated the earlier attacks on the management of the Expedition. It was published without the evidence, or, rather, with a few garbled extracts from the evidence, and thus for a brief space the whole yelping pack of revilers was in full cry again, declaring their mis-statements to have been authoritatively confirmed.

But, in due time the evidence was presented to Parliament, and the misrepresentations which had been so long and so industriously disseminated were finally exposed. Any inquirer can now satisfy himself, by reference to the Scurvy Blue-Book and the Sledging Journals, that every single statement that has been made with a view to injuring Sir George Nares is without foundation.

It was alleged that no lime-juice was taken on the sledges. The truth is, that all sledging parties leaving the ships, after the lime-juice could be used, were supplied with daily rations of it. It was alleged that the men had to drag 420 lbs. each. The truth is, that no man ever had to drag more than 240 lbs. at the outside, and that only for the first day; until the sick men themselves had to be put on sledges. It was alleged that the officers commanding sledging parties neglected their instructions. The truth is, that they followed them with the most careful exactness. It was alleged that the pemmican was salted. The truth is, that the pemmican had no particle of salt in it. It was alleged that the allowance of rum for sledge travellers was doubled. The truth is, that the usual allowance of rum was reduced by one-half. It was alleged that the men were not properly exercised before the sledges started. The truth is, that the sledge travellers had five hours of walking exercise throughout the winter, and exercise with laden sledges every day for several weeks before starting. It was alleged that in former expeditions daily rations of lime-juice were taken on the sledges. It was proved, by the unanimous evidence of the commanders of former extended parties, that they never took daily rations of lime-juice. It was alleged that frozen lime-juice, in bottles, might have been used while travelling during an Arctic April, by thawing it between the legs when in the sleeping bags. It was proved that this was impossible in March and April, and that even in the middle of May it was barely possible. It was alleged that the reason of the outbreak of scurvy was the absence of lime-juice on the sledges. It was proved that all the Autumn sledge parties and two of the early spring parties took no lime-juice, and had no scurvy; that three men were attacked by scurvy who never left the ships, and never ceased to take lime-juice daily; and that four men were so attacked while travelling with daily rations of lime-juice. It was also proved that lime-juice, frozen in bottles, cannot be used while sledge-travelling, during an Arctic March or April. Thus the evidence taken before the Scurvy Committee conclusively and finally disproved every single statement that had been made by the revilers of the Expedition, as well as the conclusions of the Committee itself.

We now come to the most serious charge, namely, that Sir George Nares neglected positive instructions to send daily rations of lime-juice with all the sledges.

This charge is based upon the 7th paragraph of the Sailing Orders for the 'Alert,' in which the following words occur:—"You have been furnished with a memorandum from the Director-General of the Medical Department of the Navy on the subject" (of precautions to be taken for the health and comfort of officers and crew). This memorandum was forwarded by the Secretary of the Admiralty to the Commander-in-Chief at Portsmouth, with a covering letter stating that it was transmitted for the information of Captain Nares, Captain Stephenson, and the medical officers of the 'Alert' and 'Discovery.' There is nothing either in the words of paragraph 7 of the Sailing Orders, or in the covering letter forwarding the memorandum, which can justify the assertion that the Admiralty intended Captain Nares to obey the suggestions of the Director-General, as orders. They are merely said to be supplied for his information. If the phrase had been "for his information and guidance," they would have been received as instructions to be obeyed, if possible. But the Admiralty very properly omitted the word "guidance."

Sir A. Armstrong, the Medical Director-General, has since attempted to make out that his suggestions were intended to be orders, because they are mentioned in the Sailing Orders, and he assumes that all that is contained in that document must bear the character of orders. This assumption is obviously untenable, and, indeed, absurd. The Manual of the Royal Geographical Society is also mentioned in the Sailing Orders, and, according to Sir A. Armstrong, all the hints and suggestions in it also bore the character of orders. It is mere trifling to assert that any document alluded to in Sailing Orders as having been supplied to the Commander of an Expedition for his information becomes an order simply because it happens to be so mentioned. The memorandum of the Director-General was merely furnished to Captain Nares for his information, and for what it might be worth, the adoption of any of the suggestions contained in it being left entirely to his discretion. There is no ground for the assumption that this memorandum partook, in the slightest degree, of the character of an order to be obeyed.

It is, therefore, perfectly clear that the charge brought against Sir George Nares, of not having obeyed an order which did not exist, is wholly without justification. Indeed, the Board of Admiralty have since publicly admitted this to be the case, and that the "memorandum" was not supplied as an instruction, but merely for information.

The memorandum of "Suggestions and Recommendations in regard to the health of the Arctic Expedition," by Sir A. Armstrong, consists of eighteen paragraphs. It is a string of the most ordinary platitudes. Paragraph 1 states that care in the selection of men is important; 2, that it should be an object

to keep them in health and vigour; 3, that they should eat two pounds of meat daily; 4, that they should drink lime-juice every day, and that tea or cocoa are preferable to spirits to work upon; 5, that they should take daily exercise; 6, that there should be a monthly medical examination; 7, that the escape of foul air should be promoted in the lower deck, and that warmth and dryness should be maintained (but there is no suggestion whatever as to how these desirable objects should be secured); 8, that hilarity and cheerfulness should be kept up; 9, that the men should be examined before sledging; 10, that medicines had better be supplied to the sledges; 11, that the use of lemon-juice should be enforced while sledging *in the same manner* as on board ship; 12, that veils or neutral-tint goggles should be used in case of snow blindness; 13, that the men should make known any casualty to their officer; 14, that the sledges should be provided with tourniquets; 15, that frostbites should be treated by gentle friction with the hand; 16, that the Director-General has sent his handbook on board; 17, also his book on *Naval Hygiene;* 18, also goggles and splints invented by Dr. Wyatt.

It will be seen that, with the exception of paragraphs 3 and 11, this memorandum consists of the simplest truisms, which might have been drawn up by the merest tyro that ever read the narrative of an Arctic voyage. There is nothing in it of which Captain Nares was not already perfectly cognisant. All such matters had been fully considered in former expeditions, and Captain Nares had carefully weighed each precedent, and decided upon every point far more fully and completely than the Director-General attempted to do in this memorandum. Sir A. Armstrong made no new suggestions except that the men should eat 2 lbs. of meat daily, which was absurd; and that (paragraph 11) "the use of lemon juice when travelling should be enforced in the same manner as already recommended for the men on board ship," which was impossible. For he tells us, it should be "mixed in a tub and drunk on deck, in presence of the officer of the watch." This is the manner in which it is to be enforced on board ship, but how it is to be enforced "in the same manner," while the men are away sledging, Sir A. Armstrong does not condescend to explain.

The fact is, that paragraph 11, like the other paragraphs, is a mere slipshod hint. But it is a hint to reverse all former experience, and to make a radical change in the well-known and nicely-balanced scale of diet for Arctic sledge parties. If any importance was really attached to this hint by Sir A. Armstrong at the time, it is quite inexcusable that he should not have fully stated his reasons for the contemplated change. He was also bound to suggest the best means of using lime-juice away sledging during an Arctic April. He knew that this had never been done before. He knew, or ought to have known, that frozen lime-juice in bottles or jars (the form in which it was supplied) could not be used. He confesses that it could not have been eaten in a frozen state. He has since suggested that it might have been mixed with the pemmican. But it is too late to make suggestions now. He ought to have explained the means of meeting all these difficulties before the Expedition sailed, if he attached so much importance to it. In not doing so he is answerable for the consequences. It has been shown, by reference to the evidence taken before the Committee, that the absence of lime-juice on the sledges was not the cause of scurvy. But if his theory had been correct, Sir A. Armstrong, and he alone, would be responsible for the outbreak.

The Committee, apart from the unfounded charge that Sir George Nares disobeyed orders, further remark that his reasons for not including daily rations of lime-juice in the dietary of the extended sledge parties were insufficient.

The reasons are not only sufficient, but conclusive. They are that, with his then knowledge and experience, Captain Nares considered the measure to be unnecessary; and that, if taken in bottles or jars (the only receptacles that were supplied) during an Arctic March or April, lime-juice could not be used.

We have placed on record this final refutation of all the attacks that have been made against the Expedition; because it will be convenient to geographers, for future reference. For more detailed refutations we would refer our readers to a pamphlet published by Messrs. Stanford, and entitled *The Arctic Expedition of 1875-76. A reply to its critics, by Rear-Admiral Richards, C.B., F.R.S.*; and to a second pamphlet, published by Messrs. Griffin, of Portsmouth, entitled *A Refutation of the Report of the Scurvy Committee, by Clements R. Markham, C.B., F.R.S. (Second edition, with additions)*. Sir George Nares can well afford to despise the attacks on his management of the Expedition. He has, in the face of unparalleled difficulties, successfully performed a great national service. He conducted the work entrusted to him with ability and sound judgment. He acted, as regards the lime-juice, just as Sir Leopold M'Clintock would have acted in the same circumstances; and no explorer could receive, or desire to receive, higher praise than that he worthily followed in the footsteps of that great Arctic authority.

Future commanders and officers of exploring expeditions must expect similar treatment from the same class of writers; but we trust that it will cause hereafter as little annoyance as it has done on the present occasion. From such writers, abuse is the highest compliment. Men who do their best, and do it well, may always be certain that the true feeling of the country is on their side.

THE BENGAL CYCLONE OF 1876.

THE Cyclone which occasioned such enormous loss of life at the mouth of the Megna, in Lower Bengal, on the morning of the 1st November 1876, has formed the subject of an exhaustive scientific investigation by Mr. J. Elliott, M.A., Meteorological Reporter to the Government of Bengal; and the result thereof lies before us in a quarto volume of nearly 200 pages, part of which is devoted to a discussion of the Vizagapatam Cyclone of the 7th October, which, alike with the Backergunj Cyclone, marked the transition from the south-west to the north-east monsoon during the month of October 1876.

Attention has been given to the subject of cyclones in the Indian Ocean since the beginning of the

present century, when Colonel Capper first broached the theory that the storms of the Indian Ocean were rotatory. Mr. Redfield and Professor Dove developed this theory, and Colonel Reid discovered the fact that the rotation of these storms in the northern hemisphere is N.W.S.E., or opposite to the direction of motion of the hands of a watch with its face upwards, and that the reverse is the case in the southern hemisphere. The indraught, or centripetal part of the motion—an important element—was discovered by Mr. Espy, of Philadelphia; and Professor Dove, who had meantime been devoting great attention to the subject of the meteorology of winds and storms, explained the opposite direction of rotation in the northern and southern hemispheres by, what he termed, the law of gyration. Professor Taylor's theory, adopted by Sir John Herschel in his work on meteorology, was that cyclones originate from an upward expansion of the air, produced by local heat, that this is followed by an indraught of air, and that the rotary motion of the earth produces spiral movement round a centre, over which a continuous upward movement of the air takes place.

The latest authorities on the subject of the Indian Ocean and Bay of Bengal cyclones are Messrs. Meldrum, Blanford, Willson, and Elliott. Messrs. Meldrum and Willson are of opinion that they are primarily due to lateral and opposite currents of winds. Mr. Blanford's theory is given briefly in an appendix to his paper on the Winds of Northern India, and ascribes their cause to a local atmospheric depression, arising from condensation of vapour, and so causing an indraught of air to the place of origin. Mr. Elliott argues that the hypothesis of parallel winds in opposite directions fails, on dynamic grounds, to account satisfactorily for the motion and energy of so large a mass of air. He, therefore, favours a modified form of Mr. Blanford's theory, and explains his views with much clearness and apparent force of reasoning, at pages 67-69 of his present Report. The excessive evaporation, which precedes the formation of the cyclones, according to this theory, occurs on the S.E. of the bay, where there is an influx from the vast evaporating region of the Indian Ocean, in addition to the evaporation from its own surface, and gradually extends northwards with the persistence of the conditions.

The materials for determining the origin and line of advance of the Backergunj Cyclone are unusually complete. A large number of vessels were at the head of the bay, where they arrived on the 29th and 30th October, and were unable to proceed up the Hughli on account of the stormy weather then prevalent over the centre and north of the bay. The logs of these ships furnish valuable information on the advance of the eastern quadrant of the cyclone. From these it would appear that the centre of the area of depression was probably in latitude 10° N., and longitude 89° E., on the 27th October, and was then moving slowly northwards. It was in latitude 13° N., and longitude 89° E., at noon on the 29th. There was a gale, cyclonic in its character, on this day in the area of depression, but the true cyclone appears not to have acquired its full intensity until the afternoon of the 30th. Its course was, generally speaking, north, with a very slight bearing to the east, and at first (at mid-day on the 30th) advanced at the rate of about nine miles an hour, soon after quickening its rate of progress till, on reaching the islands at the mouth of the Megna, the velocity of its advance was nearly 22 miles an hour, or about 10 miles an hour above the average rate of cyclones.

The alluvial lands at the estuary of the Megna being quite flat, are peculiarly obnoxious to the ravages of a cyclone. In 1822 (6th-9th June), 1867 (1st November), and 1869 (16th May) cyclones of more or less violence visited the district of Backergunj, and in the case of the first and last they were accompanied or succeeded by disastrous inundations. The ravages of the storm and wave of last November will be better understood if a brief description of the district near the mouth of the united Ganges and Brahmaputra, and of the nature of the tidal action in the north eastern angle of the Bay of Bengal, is here given.

The Brahmaputra, which rises in the plateau of Tibet, and drains the northern watershed of the Himalayas, brings down at all times a vast volume of water, which, at the point of its passing Goalpara, has been computed to be, at its lowest ebb, 146,000 cubic feet per second, representing a mass of water covering 20 square miles to the depth of one foot per hour. The Ganges brings down an almost equal volume of water, and unites with the Brahmaputra opposite Goalpara. These are joined by the Megna and the three united streams, known locally as the Megna, after a course of 100 miles, expand into a noble estuary, studded with large islands, which form three lines, stretching north and south, between which and the mainland the river finds its way to the sea. The most westerly of these three lines is formed by the islands of Badma and Dukhin Shabazpore, separated from the mainland of Backergunj by the Tetoolia River. In the centre are the islands of Nalchira and Hattya, separated from Dakhin Shahbazpore by the Shahbazpore River, and from the third and most easterly line of islands, consisting of Sundip and Siddhi, by the Megna and the Hatliya Rivers. The Sundip Channel lies between the mainland of the Chittagong district and the third line of islands. The Shahbazpore and Megna Rivers are the chief exits for the fresh water brought down by the united streams. The Sundip Channel, on the other hand, plays the part of a waste water reservoir or side channel, and its waters are always more or less brackish. The surface rises and falls with the tide, by the amount of fresh water brought down by it.

The islands at the mouth of the Megna are all low, being merely formed by the *detritus* of the Himalyas, deposited over the area in which the tidal and the river waters wage incessant warfare, alternately displacing each other. The following account, taken from a paper given in the *Statistical Reporter* for May 1876, describes the growth and colonisation of these island accretions:—

"The fluvial and tidal action by which the district of Noakholly has been formed is still at work. New *churs* and islands appear—Dega Churs as they are called; land which is under water at high tide and is visible during the ebb. These island formations gradually emerge from the water, and as soon as they cease to be overflowed by the tide, an engagement for the land, at a nominal rent, is entered into as a venture. When the grass and bush spring up, wild

men, speaking a barbarous patois, come down to pasture large herds of cattle on the young herbage, putting up sheds for the beasts, they themselves bivouacking in the open. The person who has made his venture on the land now compels the cattle-owners to pay a grazing rent at so much a head a year for their cattle, and a rent for cutting fuel is taken. In course of time, as the land becomes fit for the plough, the person settling for the land will get a man of energy, if not of substance, to take charge of the cultivation of as much land as possible, and will give him a lease for a number of years. This man, the pioneer of cultivation, and afterwards often a leader of a colony of resident cultivators, will induce non-resident ryots from the neighbouring districts to plough and sow the land, and the crops will be watched and harvested from temporary huts, and the grain carted away to their permanent holdings. As time progresses, and the land improves and the cultivation is permanently extended, ryots are induced to settle on the land and become residents. They dig large tanks for fresh water supply, and raise high mounds for foundations for their homesteads in the low country, which is intersected by numerous water-courses, and plant them round with betel, cocoa-nut, and date palms, plantains, mandar, and other trees."

The tidal wave in the Bay of Bengal advances most rapidly in the deeper and central portions. The crest of the wave which to the south of the bay is almost a straight line running north-west and south-east, between the south coast of Ceylon and the southern coast of Java. As it proceeds up the bay it becomes convex towards the shore, and, near the estuary of the Megna, encounters at an obtuse angle vast quantities of fresh water coming down the three channels referred to. The action of the two opposing masses of water is somewhat complicated. The tidal wave passes onwards slightly deflected towards the Chittagong coast, and is there deflected up the Sundip Channel. Thus, on ordinary occasions, there is an accumulation of salt water in the Sundip Channel and of fresh water in the other channels; or, in other words, a salt-water tide and a fresh-water tide.

When the tide is more than usually strong, as at full moon or under the influence of a strong S.W. wind, or when the river is heavily flooded, the opposing masses of water accumulate more rapidly, and the bore is produced. But when this occurs there are always two bores—a salt-water bore, or rush of salt water up the Sundip Channel, known as the Chittagong bore, and a fresh-water bore up the remaining channels, and called by the natives the *daula* bore. These bores, like the ordinary tidal waves, meet to the north of Siddhi, the region to the east being that of salt-water tide and bore, and that to the west that of fresh-water tide and bore. When the bore is violent, as during the equinoxes, and also when the S.W. wind is strong, it advances as a wall of water, stretching across the channels several feet high, and is so dangerous that the native boatmen will, under no circumstances, venture out into the river. Any other action in the Bay of Bengal which tends to produce a similar accumulation of sea water at the mouth of the estuary will, if sufficiently rapid and large, be accompanied by exactly similar phenomena. Hence the piled-up mass of water at the centre of the cyclone would, by its advance in the same direction as the tidal wave, necessarily produce a salt-water accumulation of water and a bore in the Sundip Channel, and a fresh-water accumulation and bore in the remaining channels.

The above explanation will make clear the phenomena of the great flood on the morning of the 1st November over the low land at the mouth of the Megna. It was due to an unusually high tidal wave, followed by the storm wave of the advancing cyclone, and was intensified by the violent north wind which prevailed from 10 P.M. to 3 A.M., and brought down the river water more rapidly than usual, and by the south-west and west winds which immediately followed, and impelled a further portion of the storm wave into the converging water area of the estuary. It was full moon on the evening of the 31st, and there was an abnormally high tide, which flooded all the low lands along the coast of the head of the bay. At Chittagong the usual tidal bore at full moon occurred about an hour and a half before high tide in the channels, and was followed by an inundation of the lower grounds of the Chittagong coast and the islands in the estuary. This inundation was a salt-water one along the Chittagong coast, and in the islands of Sundip and Siddhi, while over the low lands of the remaining islands and the Backergunj district it was of fresh water, the direction in which the water advanced in the various districts depending, of course, on their height and position with respect to the nearest water. The wind and the ordinary waves at the time were from the north and north-east; but the mass of water which caused the flood came from the south, driven by the advancing tide, and produced either a salt or fresh-water inundation, in accordance with the ordinary phenomena of high tides in the Megna, as already explained. This first inundation did but little damage to life and property. The pressure of the advancing storm wave, however, prevented the tide from ebbing, and the tidal inundation from flowing off. The storm wave, like the ordinary tidal wave, was retarded on the shallows, where it accumulated, and finally overpowered the mass of fresh water brought down by the Megna, which had been unable to find an exit seawards for the previous six or seven hours. It then rushed forward as a salt-water bore up the Sundip Channel, and as a fresh-water bore up the other channels. The account given by Mr. Porch, Officiating Magistrate of Noakholly, states that the second inundation occurred at the entrance to the estuary, or at the southern extremity of the Islands of Nalchira, Badura, and Sundip, at 3 P.M., when the vast mass of water, advancing northwards, and gradually flooding the islands to a depth varying between 10 and 45 feet, swept away houses, trees, and human beings with irresistible energy. The excessive violence of the wind from the north-east, which was a marked feature of the cyclone, undoubtedly overturned the majority of the trees, the direction in which they lay indicating the wind and not the flood direction. Except in the most exposed parts, the crops were not injured by the wind and flood; and this, combined with the independent testimony on the subject, convinces Mr. Elliott that the native accounts of huge waves, 20 and 25 feet high, must be rejected.

The phenomena of the bore certainly occurred twice, and may have occurred thrice, during the storm.

The first at 11 P.M., preceding high tide, was least violent, and covered the rice and other crops, before the wind had become very violent, in the exposed parts near the sea-shore, and thus prevented the wind from breaking down and destroying the crops, and the succeeding rushes of water from tearing them up. In Chittagong, East Sudaram, Siddhi, and Sundip, where the inundation was of salt water, the crops were almost destroyed by the action of the salt water; while the prolonged contamination of the atmosphere, due to the slowness of decomposition in salt water, the temporary deterioration of the land by saline absorption, and the subsequent origin and rapid spread of epidemics among the surviving population, occasioned much disaster.

Along the Backergunj coast, and the islands of Dukhin Shahbazpore, Badura, Manpura, and Hattiya, the inundation everywhere consisted of fresh water, except at places very near the coast, where it was very slightly brackish. The waves and inundation began at 11 P.M., and the water continued to rise till about 4 A.M., when it began to subside. The greater portion of the flood water flowed off before 8 A.M., retreating even more rapidly than it had advanced. In the Rabunbad Islands the inundation was from 30 to 45 feet deep. These islands, which are very low, and more exposed than any other of the districts at the mouth of the Megna, suffered very severely. The flood came directly from the S.W., was higher than over any other part of the wave-stricken area, and swept off 75 per cent. of the population. The Golachipa thana was protected to the east and south-east by the Rabunbad Islands, and so suffered very slightly as regards crops, though about 41 per cent. of the inhabitants were lost. In Badura and the southern portion of Dukhin Shahbazpore the wave came directly from the W. and S.W.; but at Dowlutkhan, in the former, the main body of water poured in from the upper part of the wide channel of the Shahbazpore River, coming from the N.E., as the bore and flood waters advanced with greater rapidity up the channel than over the island itself. The island of Manpura, to the S.E. of Dukhin Shahbazpore, was one of the districts that suffered most severely, the flood waters here being 40 feet deep, and carrying away 52 per cent. of the whole population.

Speaking of Noakholly Mr. Porch remarks that it will always be liable to flood by inundation, especially at the time of the equinoxes, but that a cordon of the existing tanks should be highly embanked in the same way as those higher up were embanked when the coast was many miles inland, and that this would ensure a supply of fresh water to the inhabitants in case of any future like visitations. When we consider the ravages of cholera which followed, chiefly induced by the want of good drinking water, the importance of this suggestion will be better appreciated.

At Hudrakali, east of Sundip, a man gave his experience as follows:—"It was about midnight; the sea was very high and tossing about, and coming in over the coast. I was up in a tree, and as the wind blew from the east and south-east, the water came rushing in, and with such force that I thought no place would be safe and nothing would be saved. I saw a large mass of water like the bore coming up the river as high as the tree I was on. I expected soon to be swept away by this water, but the wind suddenly came down from the north. It looked dark as it dashed against the wave, and both wind and wave stood still for a time, opposed to each other, and the wave rose up to 60 feet high and then fell back, driven by the wind, to the sea, and so I escaped."

According to the Commissioner of the Chittagong Division, the western shore of the island of Kutubdia was "strewn with the dead bodies of human beings and cattle, nearly 300 of each, while no vestige is left of any embankment, artificial or natural."

Sitakund was filled with pilgrims at the time, and, owing to the destruction of the houses, and the overcrowding consequent thereon, cholera broke out, but as they soon dispersed, the diffusion and virulence of the disease was checked. Much damage to the harvest is reported from this thana and that of Kumaria. Sundip is described as looking as if it had been on fire, the vegetation, including the large trees, seems burnt up. The port jetty at Chittagong is a complete wreck; the rice stored there was damaged to the extent of rupees 84,000, and 39,000 lbs. of tea were more or less damaged. Mr. Warden remarks that the injury and discouragement to trade and the gloom cast over the business prospects are very great, as all the preliminaries had been settled for establishing a direct trade in jute between Naraingunj and Europe, *viâ* Chittagong, the trade of which had been declining during the last three years. This would doubtless have soon been followed by the addition of many, if not all, of the other products of Eastern Bengal, which are now exported to Europe by the longer and very much more expensive route of Calcutta.

The information supplied by Baboo Srinath Ghose, manager under the Court of Wards, shows that there were probably three great rushes of water during the storm, the first at 11 P.M., in advance of, and due to the tidal wave; the second between 2 A.M. and 3 A.M., preceding the arrival of the crest of the storm wave at the entrance of the estuary; the third between 4 A.M. and 5 A.M., produced by the action of the south wind pressing an additional portion of the mass of the storm wave into the confined channel of the Megna, and causing a further inundation.

Mr. Elliott's report reproduces the report of the Master Attendant of Chittagong, on the effect of the cyclone at that port, and the graphic minute of Sir Richard Temple (a brief abstract of which was given in our number for January, p. 18), on the loss of life caused by the storm in the Backergunj, Noakholly, and Chittagong districts.

The advance of the cyclone after it reached the mouth of the Megna was very brief, as its further progress inland was prevented by the Tipperah Hills, which, interposing a series of wave-like crests or elevations running north and south, presented a formidable barrier to the rotation of the wind on the N.W. quadrant, and speedily broke it up. By 10 A.M. on the morning of the 1st of November the cyclone was completely dissolved, and the only evidence of its existence was a slight barometric depression over the Tipperah Hills, Cachar, and Assam. In the centre and north of the bay there was a clear sky and smooth sea, where, from twelve to twenty-four hours before, the wind had been blowing with hurricane force, the rain falling in torrents, and the sea tossing

about in the wildest confusion. At noon some twenty vessels, the majority dismasted and reduced to mere wrecks, were struggling feebly towards the nearest port, while a few scattered sheets of water on land were all that was left there to indicate that the now houseless, starving inhabitants of one of the richest and most populous districts of Bengal had been visited by a flood more destructive in its character than history has yet recorded.

The recent papers received on this subject show that the loss of life by drowning has proved, on investigation, to be much less than was originally supposed. No regular census has been taken, as it was feared that the people would consider this to be a hardship at such a time; but, from estimates, it would appear that in the three districts of Chittagong, Noakholly, and Backergunj, about 100,000 were drowned, instead of 215,000, as at first supposed. Cholera has, however, subsequently set in, and the ravages of this fearful disease, aggravated by the presence of decaying corpses, damaged food, contaminated water, and imperfect shelter, carried off no less than 75,000 in the three districts referred to by the end of March, when, thanks to the exertions of the Government officials, it was finally stamped out.

AFFAIRS IN JAPAN.

INTELLIGENCE from Japan shows very clearly that the position of the Government of that progressive and interesting country is somewhat critical. Its conduct of affairs has had the effect of producing a series of rebellious outbreaks, the participators in which are numerous and thoroughly in earnest, though their efforts have been, so far, rendered unsuccessful by the want of organisation and simultaneous action among them.

The latest movement, in Satsuma, is the most formidable which has yet occurred. The insurgents are said to be 18,000 in number, and are opposed by 20,000 Government troops. They are headed by Saigo Kichinosuke, whose fame for daring, and his ability to organise and lead troops, is unequalled in Japan. He was the chief instigator of the movement of 1867, which placed the present Government in power, and he personally conducted it to a successful termination.

The announcement made by the Japanese Embassy, that the rebellion has been wholly suppressed, should be received with extreme caution. The mountainous nature of the country in which operations are being carried on makes the attainment of any decisive advantage on either side extremely improbable; and, further, the causes of the rebellion are too deep seated and too widely felt to give any hope for its immediate suppression. If a rising is quelled in one locality it is quickly followed by one more formidable in another; and the Government will require all its power, and the firm loyalty of its present supporters—which rumour says it does not possess—to withstand such continued attacks.*

* The newspapers published in Japan openly accuse the Government of not only suppressing any news favourable to the rebels, but of sending intelligence to the various embassies abroad, worded so as to convey an entirely wrong impression of the state of affairs.

To enable a clear conception to be formed of the position of affairs, it may be convenient to describe, concisely, the political events of the last few years.

The rebellion of 1867-8 ended in the overthrow of the *Shô-gun or Taikun;* the emergence of the *Mikado* from retirement, and his taking the active control of the affairs of the Empire into his own hands. The feudal chiefs *(Daimios)*, who formerly held absolute possession of certain portions of the country, then relinquished their property and their authority to the *Mikado*, but were allowed to reside in and to administer the local affairs of their former territories. Each *Daimio* had a band of armed retainers attached to his service, who were in the receipt of certain emoluments, some in yearly payments, others in landed property. They held a rank which formed a very marked distinction between them and the merchant or labouring classes, the badge of which was the privilege of wearing two swords. They are generally known as *Samurai*, and their aggregate number is nearly two millions.

The *Mikado*, in accepting the territories of the *Daimios*, entered into engagements, first, to discharge all their liabilities, some of which were considerable, and to accomplish this a loan of 2,400,000*l.* was raised on the London market; second, to give them hereditary pensions proportioned to their former wealth and position; and third, to continue the payment of the hereditary pensions of the *Samurai*.

But he, being then a boy of twenty-two, and whose life had been passed in the closest seclusion, was unfit to exercise his powers, and two of his former councillors, named Sanjio and Iwakura, were installed as chief advisers and first and second Prime Ministers of the new Government. Its other members did not belong to the old families of the *Daimios*, but were selected, in some cases, from the lowest ranks of the *Samurai*. The part they took in the rebellion, and their general intelligence were probably what induced their election. The Government, so constituted, was regarded by the old noble families and their retainers with considerable jealousy and suspicion; but it, nevertheless, was endowed with supreme and irresponsible jurisdiction, and immediately proceeded to take steps of a more or less revolutionary character. Its action, in the introduction of Western improvements has not caused any general dissatisfaction, though the recklessness with which new schemes were entertained, and the wasteful expenditure which was incurred on them, would have been good grounds for this; but the Japanese, generally, have too high an appreciation of the advantages of the introduction of European appliances to be too easily led into any feeling against them. It is in the rapid and violent changes in the domestic relations of the people, made in a tyrannical and arbitrary spirit, that we must look for the present disturbed state of the country.

The first movement of a revolutionary character made by the Government was the recall to the capital of all the old *Daimios*, and the abstraction from them of the little remaining authority which they possessed. The country was re-divided, the old landmarks were destroyed, and new Government officials were appointed as the local authorities for each district. This step, which finally obliterated all traces of the feudal system, though looked upon as a bold one, did not at the time create any special signs of dissatisfaction.

Many orders of a distasteful character then emanated from the Government. The method of wearing the hair was changed, European costume became the official dress, the labouring classes were admitted to the army and navy, they were also permitted to ride on horseback, the wearing of swords by the *Samurai* was discontinued, and other class distinctions were removed.

The *Samurai*, much dissatisfied, and deserted by their former chiefs, who were either living in retirement or had gone abroad, spread themselves through the country in idle, discontented, and quarrelsome bands. But the Government, imagining its position to be sufficiently established, took a further step, which has, not unnaturally, fired the spirit of the whole class. The sum, payable annually to the *Daimios* and their retainers, on account of their pensions, causing a drain on the country's resources which seriously crippled them, the Government decided to adopt a scheme for the capitalisation of these, which was promulgated in August last. The amount of capital payable to each person is calculated on a basis of from five to ten years' purchase. Bonds, bearing interest, are given in lieu of cash, which are redeemable, by instalments, in thirty years. In this time, therefore, the Government will be entirely relieved of the obligation, while the present annual relief to the revenue is calculated at one and a half millions sterling. The position of the *Samurai*, however, is an extremely hard one. They are men unaccustomed to labour, and, in the great majority of cases, unfitted for it, who were in the possession of land, or in receipt of incomes, which they imagined were personal and permanent property. They accuse the Government of a breach of faith, of repudiating its obligations, and of interfering with the rights of property. The ancient chivalry of the class is considered as doomed. It is said, with characteristic *naïveté*—"Henceforward the national spirit of Japan will only decline. It has hitherto been preserved by the *Samurai*; but the result of the abolition of their pensions will be, that they must of necessity become farmers, merchants, or labourers, and how then can they maintain their former courage?"

In October last, a former member of the Government, and a most influential official named Mayebara, headed an insurrection in the province of *Higo*, in the island of *Kiushiu*, which spread to the neighbouring provinces of Chikuzen and Buzen, and crossed to the main island, where it convulsed Chôshin and Suwo. All this district is famous for the spirit and valour of the *Samurai*, and Mayebara had distinguished himself as an able leader in the rebellion of 1867. The Government succeeded in quelling the movement, after some slaughter on both sides, and Mayebara, with about fifty of his principal followers, were summarily executed. The present rising in Satsuma, headed by Saigo Kichinosuke, occupies, to some extent, the same ground as the former one, and surprise has been felt that Saigo did not, then, join his forces with those of Mayebara. The latest news gives some explanation of this.

Saigo Kichinosuke has been before his countrymen as a successful leader of opinion and an intrepid soldier for the last twenty years. He has, on many occasions, given proof of his patriotism and daring, and his life is full of those romantic incidents common to the wild species of warfare which was carried on in Japan in recent years. He was the Commander-in-Chief of the *Mikado's* forces before Yedo in 1868; and to him the *Shô-gun* surrendered. He afterwards held one of the highest positions in the *Mikado's* Government, but, disagreeing with the policy of his colleagues, he retired to his own country (Satsuma) in 1873, where he has since lived in seclusion. Vague and alarming rumours have since been constantly circulated regarding Saigo's proceedings. It was frequently hinted that he was devoting himself to the organisation of a movement among his clansmen against the Government. On the other hand, it was asserted that the eagerness of the Satsuma men to take arms was only restrained by the loyalty and influence of Saigo. There are evidences that the Government was kept in constant fear of this clan; for instance, an understanding was said to have been come to with its Governor that he might observe or not imperial notifications at his discretion; and it is also said that no attempt was at first made to force upon the Satsuma *Samurai* the capitalisation scheme. It exercised, therefore, a preponderating influence upon the Government, and Saigo had almost supreme control over it; and the assumption is that, as he did not league himself with Mayebara in October, he was, up to that time, loyal in his sentiments. But he was regarded with suspicion, and the cause of his now having changed into one of the fiercest opponents of the Government is shadowed forth in intelligence received lately from Japan, which tells us that a plot was laid to assassinate him, in which certain members of the Government are compromised. It being frustrated, a full confession was made by one of the men hired to carry it out. This man was employed by the Chief Superintendent of Police in Yedo—himself a Government official—and a very general belief exists—which, however, requires verification—that it was a scheme connived at by the Government as the first step towards reducing the Satsuma clan to allegiance.

But the disaffection of the *Samurai*, and the fierce hatred of one of the greatest men the country has produced, probably caused in the manner above described, are not the only forces which the Government has to contend against. There is a wide-spread discontent among the agricultural and labouring population. The farmers, who are poor, and who maintain a constant struggle to fulfil the demands made upon them for the public purse, subscribe three-fourths of the revenue of the country. The taxes from them were formerly levied in rice, but the Government recently directed that these should, in future, be paid in money. The farmers assert that the Government officials put an unfair value on the rice, and they are consequently mulcted in a larger quantity than before. A re-measurement of the farms was also recently ordered, and, as it was found that considerable additions had been made to the area of some of these, the holders became liable to additional taxation. Here, it is not a question so much of justice as one of the absolute inability of the farmers to submit to these increased imposts. In all parts of the country, risings of the agricultural population have occurred; and some, though not of a dangerous character, have led to considerable inconvenience. Quite recently the Government has, from motives of prudence,

reduced the rate at which the land-tax was levied from 3 per cent. to 2½ per cent. on the value of the land. This measure has restored quiet for the time, but it has caused a reduction of nearly two millions sterling in the revenue, and necessitated wholesale reductions in various branches of the Government service.

The Government, with a most difficult task before it, has acted in a too precipitate and arbitrary manner. It has, doubtless, been actuated by motives for the further advance and prosperity of the country; but its action has been characterised by the usual Asiatic cunning and want of candour, by no consideration for the old habits and tendencies of the people, and by an almost utter disregard of the rights of an acknowledged property. The present rebellion is said to have already abstracted over two millions sterling from an almost entirely exhausted exchequer; and, by the latest news received, the Government troops have, as yet, gained no important advantage. Serious risings are occurring in other parts of the country, and the Government, even if eventually successful in quelling them, will have received a shock, both morally and financially, from which it will scarce recover.

R. H. BRUNTON.

THE LIVINGSTONIA MISSION.

NARRATIVE OF DR. J. THORNTON MACKLIN.

THE following interesting letters from Dr. J. Thornton Macklin and Dr. Stewart, of the Livingstonia Mission, have been forwarded to us from the Cape, by Sir Bartle Frere:—

"The site on which Blantyre Mission Station rests is an admirable one in every way, and reflects great credit on Mr. Henderson, who, it must be remembered, went out with the Free Church Party, under Mr. Young, of the Royal Navy, in 1875, for the purpose of looking round the country and finding out a suitable place where to establish our Mission. In the course of his travels Mr. Henderson came to the conclusion that the most suitable locality would be somewhere in the Shire Highlands, among the Ageneas, and, if possible, in the vicinity of Magomero, the scene of the University Mission labours. Accordingly, when our party had arrived out in 1876, and had reached Ramakukau's village, which it may be said is practically the head of the Shire navigation, though seven miles below Matili, to which place boats can reach, here Mr. Henderson left us, and went up the hill to fix definitely on a site for the settlement. I should have gone with him, but was ill with fever at the time. The carefulness and discrimination shown in the selection—the result of a long experience in Australia—clearly points out that Mr. Henderson was well worthy of the trust reposed in him, and well fitted to perform the difficult task laid upon him. A short time ago there was a village here, but it was deserted some time before we came, as the head man had been killed, it is said, by Ramakukau. He was buried in his hut, which was knocked down, and the place was left. When Mr. Henderson came he found several standing, and these he had repaired and put in order for us to dwell in until such time as we got more suitable houses built.

"Now as to the advantage of the site, and first as to its healthiness. The altitude is good, as we are upon the third plateau of the Shire Hill, which is about 3000 feet high. Thus we are high above the malarious level, not, I mean, to assert that altitude necessarily procures immunity from malaria, for even in the hills, if one chooses to settle down in a hollow or low-lying marshy place, he will probably find more than enough of the miasmatic poison developed than is conducive to health. The temperature is very suitable, being equable, rarely in the shade rising above 80°, and rarely falling below 70°. Drainage is good, and is secured by the settlement standing on a rising ground or knoll, from which the ground slopes away in every direction, so that during the rainy season no water accumulates in our immediate vicinity.

The water supply is good, both as regards quality and quantity, and it is but a short distance off. Again, almost every day a fine breeze prevails, which is cool and bracing, yet mild. I think, therefore, all things being considered, I can congratulate both ourselves and the friends of the Mission at home on the healthiness of Blantyre. Concerning the matter of cultivation, things are satisfactory. The soil is good, and already we have got a large garden, producing not only plants indigenous to the soil, but also home plants and others we got from the Cape. Now a few words as to the conveniences of the situation. We are but two days' march from Ramakukau's, thus we can have speedy access to the coast, Kongoni, or Quillimane. Again, we are within the same number of days' journey from Pimbe, on the Upper Shire, the place to which the 'Ilala,' the steamer of the Free Church party, comes down, so we are also within speedy communication with Lake Nyassa. Lake Shirwa is only three days off at the most, and from there the natives bring us very good fish. We are also only one day's journey from the Ruo; but as it flows through a bad and uninhabited country, it cannot be said to be much of an advantage in the meantime.

"*General Aspect of the Country.*—Hills and dales, all well wooded and covered with vegetation of different kinds. In some places very rank and dense indeed. I have been caught and held fast in the thicket more than once. In most parts wild flowers abound of many and varied hues, which, in the midst of the fresh green verdure that prevails, relieves it, and is very pleasing to the eye, and in some cases our sense of smell is much gratified. Our water-courses and streams are rich with vegetation of every kind and variety. Many different kinds of ferns abound; but I do not think any have yet been found that are not also to be found at home. Very fine and large trees are plentiful on the banks of the streams, too, and some good planks might be got out of them; but generally the trees which prevail over the country are low and stunted: they are principally acacias. Sometimes one emerges from the wood into fine glades covered with long waving green grass: these, in some cases, much resemble the parks in the confines of a gentleman's grounds at home. They are very picturesque. The mountains are high and steep, with many deep ravines. They are clad with verdure to the very top, from the midst of which the brown rocks may be seen lifting up their ancient weather-beaten heads, lending enchantment to the view. Here and

there are large fields of corn and pumpkins flourishing, helping to relieve the wild appearance of the country. The gardens are often far away from the villages in the season, the people leaving their homes and living in temporary habitations for the purpose of cultivating them.

"The people are quiet and peaceable and well disposed. They are fond of fun and music. They are impressible, expressing great surprise and pleasure at the sight of pictures, our guns, pistols, watches, and other, to them, wonderful things. They are quick and intelligent, and pick up with a wonderful degree of alacrity what you want or mean. Their features are not at all unpleasant to look upon, and there is great variety; the expression is generally happy and comparatively intelligent. Their stature is very good, and so, too, their physique; in height, on an average, of about 5 feet 6 inches to 5 feet 8 inches. The following measurements I have taken, of which I give the average: the head, in circumference, 21¾ inches; chest, 34½ inches; arm in length, 22½ inches; hand, 6½ inches. The measurement of the pelvis by a foot I have not yet ascertained, but they are well proportioned. They are lithe, supple, and active in their movements. They are a bow-and-arrow people, and distinguished from those tribes whose chief weapon is the spear, though now many of them have flint-lock muskets, which, curiously enough, are all branded 42nd Regiment, and have a crown on them. There is one thing they are very fond of doing, and that is, gathering themselves together to one place, talking and drinking 'pombe,' *i.e.*, native beer,—of course, men only; the women do not take part in these proceedings. Smoking is a common habit among them; even women and very little boys smoke, and if they would confine themselves to tobacco it would not matter much; but they have a very pernicious habit of smoking hemp and bang, which produces a kind of intoxication—a hysterical fit I should be inclined to call it; but the effect it produces, be it what it may, seems to be very pleasant, for they practise the habit most pertinaciously, though it produces a severe fit of coughing, which is most painful to hear, if not to experience. The women, like the men, are well formed, and of a good height. They seem quite contented and happy, though undoubtedly they do the most work; still, they are not in any way ill-used by the men. The features of most of the elderly women are disfigured by tattoo marks, and the hideous lip-ring, or pilele; I say the elder women, for I am happy to say that the younger women are not adopting the foolish fashion of wearing the pilele, though most undergo the tattooing operation.

"*Industries.*—These are chiefly iron manufactured into various stages, in which they have reached a considerable degree of perfection. *Basket-making.*—In this I would say they have reached perfection, but then I am not a competent judge. *Cloth Manufacture.*—In this trade their attainments are of no mean order, both as regards cloth manufactured from the bark of trees or that from cotton. Of these I will give you more details in a future letter, when I will also speak of their habits, houses, food, and other matters that may prove of interest."

The following letter is from the leader of the expedition, Dr. Stewart, to Mr. Dunn:—

"Livingstonia, Lake Nyassa,
27th February, 1877.

"Since I wrote you in December, I am glad to be able to say that things here have been going on well, nothing of any consequence of an untoward kind having occurred, while there is much to be thankful for. There have been a few cases of fever, mostly slight, and lasting only a day or two. With this exception, and that of a chronic case which improves but slowly, the health of the party is fairly good; we cannot expect, in latitude 14° in Central Africa, the robust vigour and energy we enjoy in latitude 30° or 50°.

"During the last few weeks, or since the beginning of this year, Livingstonia seems to have taken a start, and began to grow in one of the directions we specially wish it to grow—as an anti-slavery centre. There were very few people actually settled here in 1876: up to October, at least, not a dozen. Since then, some five or six parties, the smallest numbering from one or two up to twenty-two, have come seeking the protection of the English. The story of these twenty-two is this: A man arrived here in the middle of the night, in the fragments of a large canoe, in which I feel certain no white man would venture one hundred yards from the shore, yet it appears that he had been part of the two days and nights in this crazy affair. He had slept on the sand all night, and made his appearance in the station about six in the morning. He was in a woeful condition, but told his story with directness, and said he and twenty-one others were about to be sold by Inpemba, a notorious slaver on the western shore of the lake; that they saw the dhow which had come, and having got information from a friend, they fled in the night, in a large canoe, and made for an island to the north; that their canoe had got broken on the rocks as they landed, and he had come in the patched-up fragments to ask the assistance and protection of the English; that there were twenty-one men, women, and children on the island. There was not much time for delay or consideration—they had nothing to eat, and no means of getting away. We accordingly got up steam in the 'Ilala,' and, taking the fugitive for our guide, made for the island, which we reached about one o'clock. We approached it cautiously, partly on account of the rocks, and partly because I was not sure whether he might not be leading us into some trap, though I have never uttered that opinion till now; but a little doubt in such circumstances, and with new men, is wholesome. The natives saw us, though we did not first see them, as the trees come down to the water's edge. He shouted, and they replied. We sent off the boat, and shortly had all of them on board. There they certainly were—twenty-two men, women, and children. They had only a few hoes, the bows and arrows usually carried by the natives, a little maize in a calabash, and a few wild roots gathered on the island. We got up the anchor and steamed off, arriving at the station at sunset; and the Fugitive Slave Circular never crossed my mind till I sat down to write this. On the contrary, as we made rapid way homewards over the glassy lake, on a very fine afternoon, I thought the 'Ilala' was just about her proper work. It is true she is not a fighting ship, intended to burn and sink dhows, and frighten Arabs out of their skins and colour, but she is peacefully circumventing those

senseless chiefs who weaken themselves by selling their people; and in many ways the steamer has been a great element in our progress and in the security of the position we have attained. Both would have been different and very much less without the steamer. Of course the slaving chiefs cannot look with friendly eyes on these doings, and two efforts have been made to get back the refugees. We have seen no occasion, except in one instance, to give them up, and the applicants have generally departed crestfallen. We tell them—if any man accused of a serious crime comes, and they show that he is guilty, we shall not receive him; but anyone running away to escape being sold, will be protected. Out of these cases some complications may yet arise of an unlooked-for kind. In the meantime we cannot do otherwise than as we are doing, even though the increasing numbers lead us into a difficulty about food till their crops are ready, and some were rather late in sowing. We have to feed about one hundred daily, and even though the ration is little over 1½ lb. of maize, we are sometimes in a strait; a ton of maize or Kafir corn does not last much more than a fortnight or three weeks. But this giving out of food is not gratuitous; all work at roads, fields, or house-building, or whatever is on hand. We have not an idler about the place, not one. The rule is simple: He who will not work for his daily maize stays not here.

"The school goes on steadily; and the daily meeting with the people, now generally held in the evening, is kept up regularly, and apparently with interest. The meeting is frequently closed by one of Moody and Sankey's Hymns; and when it is well sung in parts, it produces a very marked effect, even though they understand but generally what the hymn is about from a few words of previous explanation. I have great faith in the daily religious service. Some time soon it will bear fruit.

"The first tusk of ivory was brought into the settlement a fortnight ago, and bought by Mr. Cotterill for 14*l.* I shall not mention the weight of it, but simply say I would not recommend any one to come here to purchase ivory at present, with the view of making a profitable business of it. Mr. Cotterill apparently bought it simply to commence operations and to encourage the others.

"Our first visitor from the outside world also arrived at Livingstonia the other day. He comes straight from the Punjaub, where he has been working as an engineer for eight years on the Sirhind Canal, and having a furlough of two years, and having also been in Europe lately, and wishing to spend a part of his furlough in some useful way, comes here and asks if he can help us, and place himself as a volunteer on the Livingstonia force for a year; and all this from pure interest in the enterprise and in the success of missionary work. If he was not a relative of my own, and also a James Stewart, I should be disposed to say this example is worth following by Christian men who have occasional periods of leisure. Here is a vigorous young fellow who does not care for spending two years in lounging about continental picture galleries or in the pleasant work of the old country, but who believes he can be of use elsewhere, and forthwith, after one or two letters on the subject, starts off, and we have him here amongst us. The idea is a new one: and it suggests that many young men of different professions and occupations might aid the mission cause temporarily, and yet permanently benefit it by a similar course of action. His coming has already benefited us, and cleared up our misty news on various pieces of work going on or to be attempted. The first important work, however, that he will undertake will be a survey of a road over the Murchison Cataracts. We shall probably offer this survey, when completed, to one of the branches of this great International Society inaugurated by the King of the Belgians: it will form an *experimentum crucis* as to whether actual work is intended by that Society. If they do not aid in the making of the road, we shall just have to make it in an inferior style ourselves.

"We also got here last week our first importation of cattle, consisting of seven cows, three calves, and a bull. They were brought 450 miles, partly by land and partly in the steamer, and the business was well managed by Dr. Laws. I fear, however, we have *tsetse* in this district, and, if so, it is a heavy blow to us. A short time will make the matter plain—a few months at most. No worse blow to our peaceful progress and prosperity could occur than this.

"Since writing the above an accident to a portion of the machinery of the steamer has caused delay in sending this off. The mischief is now quite repaired.

"March is one of the most unhealthy months here (April further down), and both Dr. Laws and myself have had pretty severe attacks, and some of the others have also suffered. The last man to succumb, Shadrach Ngunana, from Lovedale, who has never yet had the slightest touch of fever, has suffered slightly. Average health among the others. A greater variety and better food would prevent that anæmia that seems to be the worst part of the fever.

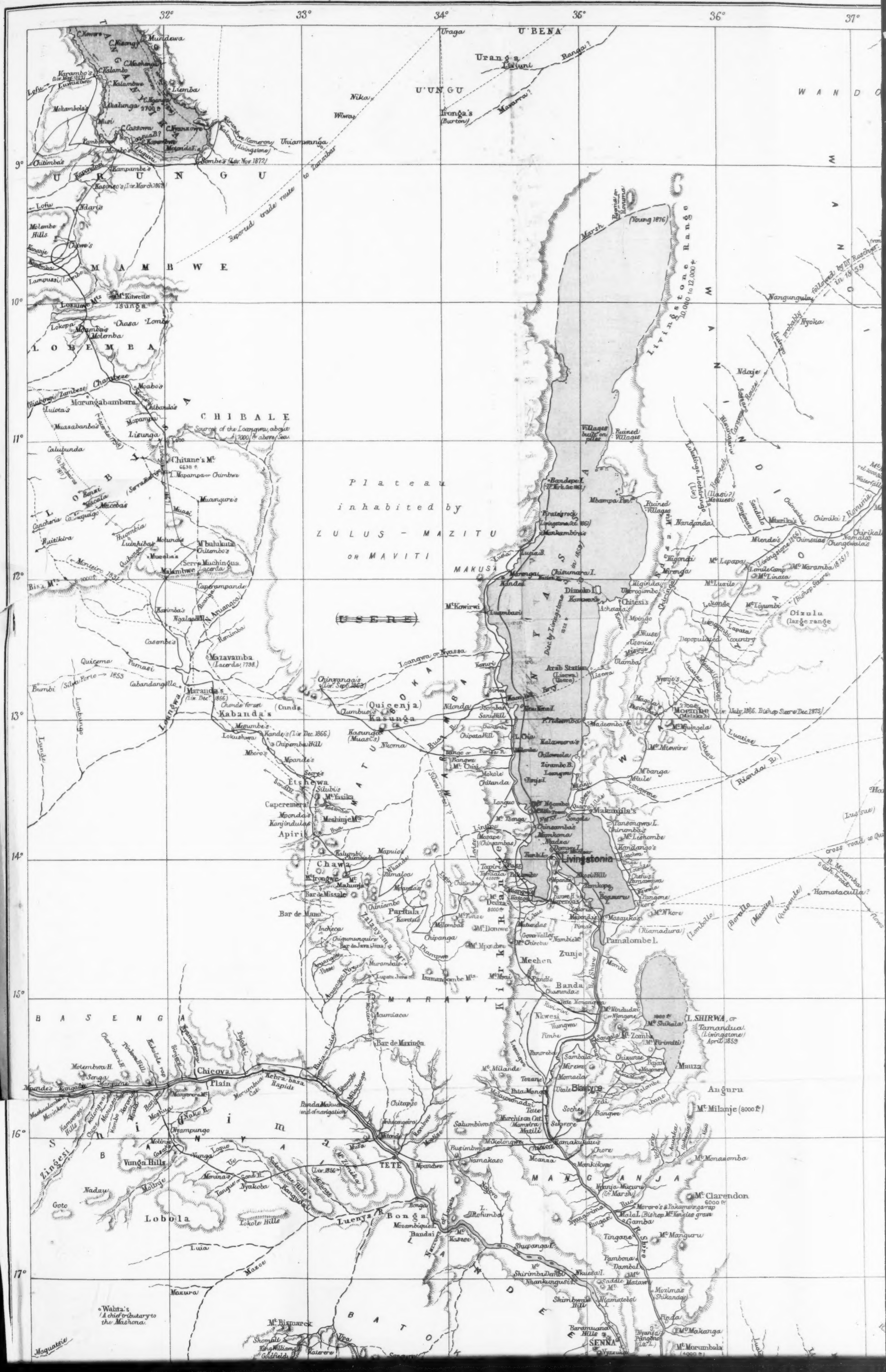
"JAMES STEWART."

THE GREAT EARTHQUAKE ON THE COAST OF PERU.

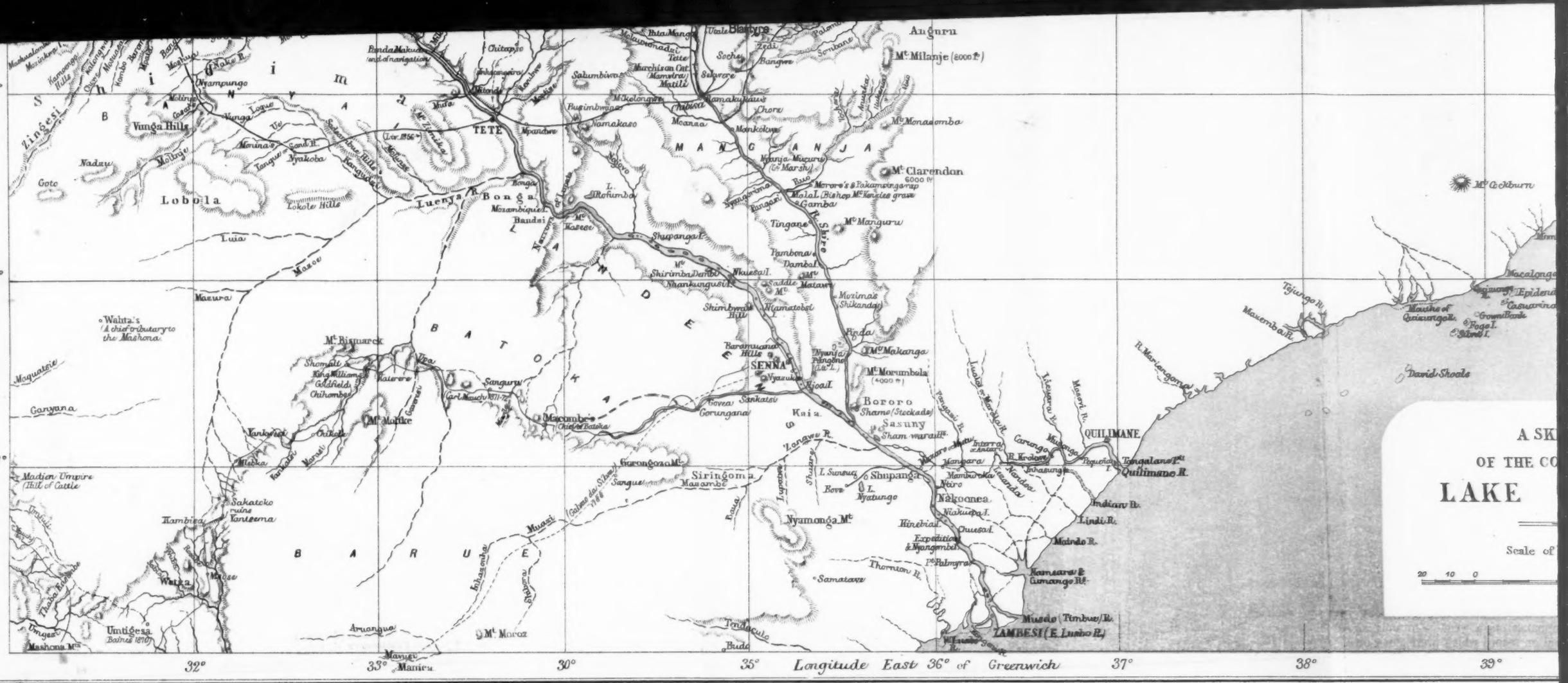
(MAY 9TH, 1877.)

THE earthquake, with its accompanying inundating wave, which spread desolation along the coast of Peru on the 9th of May 1877, was one of the most destructive on record. These convulsions of nature deserve close attention from physical geographers, and we therefore propose, before describing the more recent catastrophe, to give a list of the recorded earthquakes on the west coast of South America. At Lima there are, on an average, about eight shocks of earthquakes in a year; and only those have been placed on record which were so violent as to cause destruction of life and property. Mr. Mallet has compiled a valuable list of all recorded earthquakes in every part of the world from the earliest times to the year 1842,* which was continued down to 1850 in the annual catalogues of Professor Perrey, of Dijon. But the list is incomplete, and we have supplemented it from other sources. The principal autho-

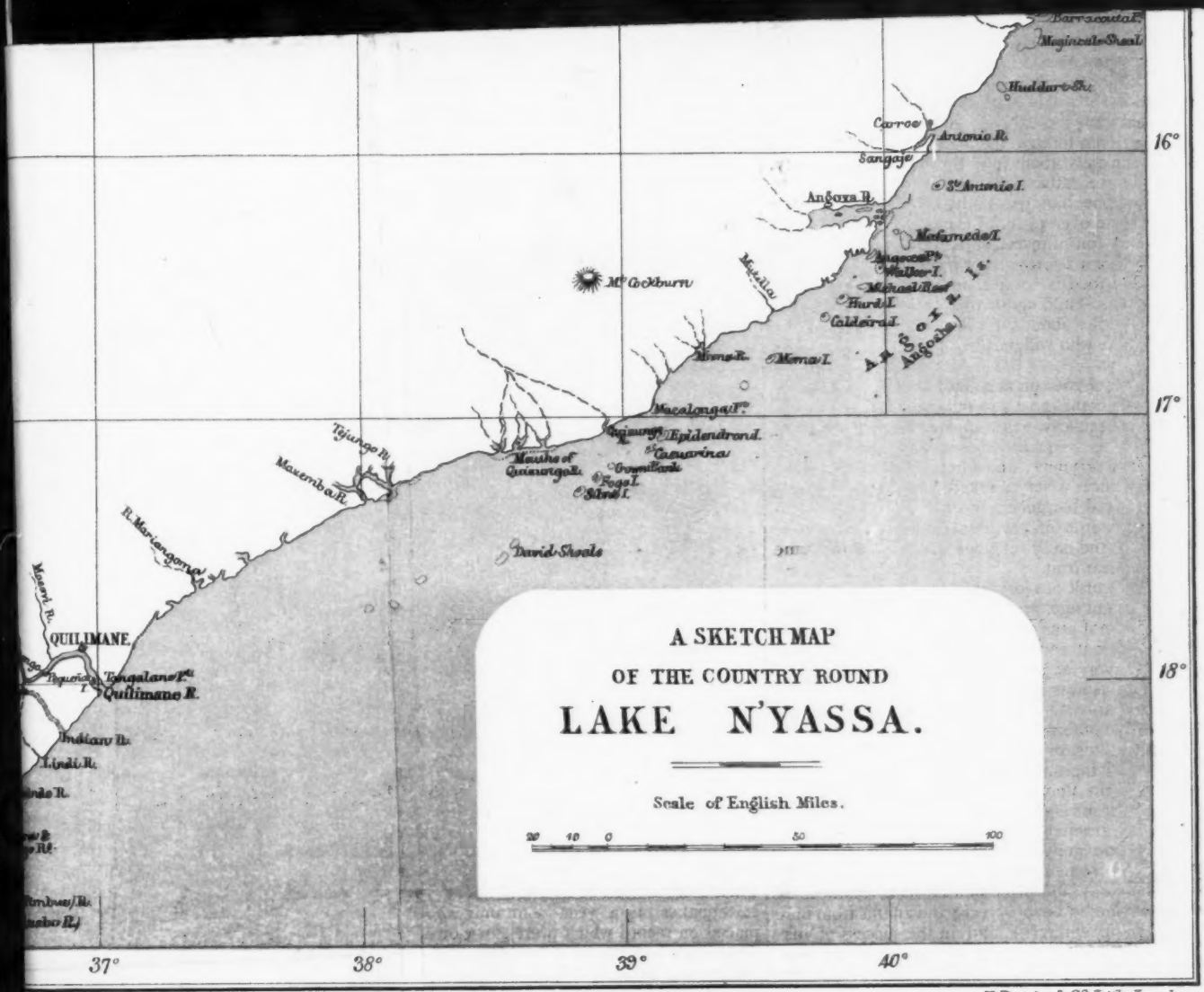
* *Earthquake Catalogue of the British Association.* By Robert Mallet, F.R.S., and J. W. Mallet. 1858. See an account of Mr. Mallet's labours in Sir R. Murchison's Anniversary Address for 1859. (*R.G.S.J.* vol. xxix. p. 157.)


32°
33°
34°
35°
36°
37°
9°
10°
11°
12°
13°
14°
15°
16°
17°
U'BENA
U'UNGU
WANDO
MWEMBE
U R U N G U
M A M B W E
L O B E M B A
CHIBALE
MAKUSI
MARAVI
BASENGA
MATUKA
MANGANJA
SENNA
BATONKE
Plateau inhabited by ZULUS - MAZITU OR MAVITI
(USERE)
Livingstone Range
10,000 to 12,000 ft.
Uraga
Uranga
Uzaramo
Nika
Wiwa
Ukami
Ukaranga
Ukalunga
Uniamaranga
Reported trade route to Zanzibar
Karambo's (Lieut. Nov. 1831)
Lumaluero
Mohambola's
Liemba
Kalambo
Kalambwe
Kirombwe (Cameron)
Kalambo (Livingstone)
Chitimba's
Kampambe's
Kasonso's (Lieut. March 1867)
Lofu
Ndaris
Molembe Hills
Cisne's
Kawanje
Lampussi (Lieut.)
Mt. Kitwettu
Losaine Mts
Isunga
Lokopa
Chasa
Lomba
Mpamba's
Molemba
Chambeze
Moaboo's
Chibanda's
Morungabambara
Luiota's
Muasabamba's
Mapampa
Lisunga
Source of the Loangwa, about 7000 ft. above Sea
Calubunda
Chitane's Mt.
6638 ft.
L. Mapampa or Chimbwe
Muangwe's
Muasi
Benzi
Kacala
Miecbas
Concheria
Luitikira
Luambia
Luinhibas
Motunde
Mbuluku's
Chitembo's
Muesiua
Serra Muchingua
Malambwe
Monteiro 1831
Bisa Mts.
Caperampande
Karimba's
Ngalapa Hill
Aruangoa
Casembe's
Mazavamba
(Lacerda 1798.)
Quicema
Pamasi
Silva Porto 1853
Cabandangolle
Maranda's
(Lieut. Dec. 1866)
Chonde forest
(Cunde)
Kabanda's
Loangwa
Lumbungu
Luende
Bumbi
Lokushwa
Megumbe's
Kande's (Lieut. Dec. 1866.)
Chipemba Hill
Mboro?
Mpande's
Seore's
Etshewa
Caperemera
Mponda's
Kanjindulas
Apiri
Meshinje Mts
Bua
Mt. Yasika
Silubis
Loangwa or Nyassa
Chinganga's
(Lieut. Sept. 1863)
Kasunga
(Quicenja)
Qumbuni
Kasungo
(Muata's)
Nkoma
Kanuri
Ferry
Arab Station
(Lisewa)
(Unce)
Lisewa
Ndonda
Kombas
Sarui Hill
Chipata Hill
Mpindo
Mbango or Furious R.
Mt. Chisi
Mokole
Chitanda
Kamanga's
Mt. Chia
Kalamera's
Chilomola
Zirambo B.
Lengwe
Lenji I.
Mt. Tsenga
Chinsamba's
Mankoma
Madza
Domwe I.
Tumbi I.
Livingstonia
Mosiu Hill
Tapiri
Tehtala
Mpanda
Mt. Dedza
8000 ft.
Mt. Dzunze
Mt. Donwe
Mt. Mpondwe
Mt. Chirobu
Mt. Mpondwe
Mt. Mrai
Isamamombe Mts
Chiromo
Pandie
Banda
Chasunda's
Tete Komanga
Nkwesi
Tungwa
Pimbe
Sangale
Mt. Zomba
Mt. Firomiti
Mt. Milande
Terere
Mt. Kirkudzi or Mongoni
Mt. Shikela
L. SHIRWA, or Tamandua (Livingstone April 1859)
Mauza
Anguru
Mt. Milanje (8000 ft.)
Mt. Clarendon 6000 ft.
Mt. Monasomba
Mt. Mangaru
Mt. Lepapa
Mt. Maramba (1875)?
Mt. Lwila
Mt. Liyumbi
Oizulu (large range)
Lepata country
Depopulated country
Mt. Mitewire
Mt. Mulungela
Mocumba (Matakas)
Liv. July 1866. Bishop Steere Dec. 1873
Mt. Kowirwi
Lusambazi
Dimolo I.
Kamwala
Kiginda
Usongombe
Chitesi's
Achatala
Mpindo
Nkuse
Usenia
Mwinye
Ulamba
Lokande
Lwanga
Lwasiwa
Lwasiwa
Riendaa R.
Mbanga
Miule
Mt. Leshombe
Kandango's
Ligobwa
Tonga
Chelwa
Panamowa
Mwanga
Trangone
Mkore
Mt. N'kore
Mosaukas
Pamalombe l.
Zunje
Mechen
Mombe
R. Shire
Nangungula
Nyoka
Ndaje
Sandalo
Mtarika's
Chimaka I.
Chirikal
Nomalos
Chengewalas
Mt. Maramba (1875)?
Mlende's
Chimsolas
Mt. Linaza
Lemule Camp
Mt. Lepapa
Mt. Luwila
Mt. Liyumbi
Oizulu
Lepata country
Depopulated country
Mt. Mitewire
Mt. Mulungela
Mocumba
Liv. July 1866. Bishop Steere Dec. 1873
Hamatacuilla?
Mt. Mwamba
Mt. Mlanje (8000 ft.)
Mt. Monasomba
Mt. Clarendon
6000 ft.
Mt. Mangaru
Mt. Manguru
Mt. Milanje
Mt. Makanga
Mt. Morumbala
(4000 ft.)
Chicova Plain
Kebra-basa Rapids
Motembwa H.
Serra
Mangaine
Mt. Morangere
Mt. Mlanje
Mt. Milanje
Mt. Zomba
Mt. Firomiti
Mt. Shikela
Mt. Kirkudzi
Mt. Milande
Mt. Mlanje (8000 ft.)
Mt. Clarendon
6000 ft.
Mt. Monasomba
Mt. Mangaru
Mt. Manguru
Mt. Makanga
Mt. Morumbala
(4000 ft.)
Mt. Bismarck
Shomali
King William's Goldfields
Katerere
Ira
Waita's
A chief tributary to the Mashona
Maxura
Maquatsie
Nadau
Goto
Lobola
Lokole Hills
Luia
Maxoe
Vunga Hills
Vunga
Loque
Morina's
Sand R.
Tongue of Nyakoba
Nyakoba
Maibje
Kangue
Tete
Mpandure
Luenya R.
Bonga
Mozambique
Bandai
Lamande
Lupata
Shupanga I.
Shirimba Dembo
Nhankungusi
Saddle
Matawe
Morimas
Shikandas
Shimbwa Hill
Niamatobsi
Pinda
Baramuana Hills
Nyanja Pangono (a L.)
SENNA
Vyazuko
Mt. Kasee
Mt. Rofumba
Mt. Tingane
Mt. Mangaru
Gamba
Malal. (Bishop Mackenzie's grave)
Mororo's & Pakamonga rap
Rua
Nyangwina
Bunga
Lupata
Lupata
Lupata

35°
36°
37°
38°
39°
40°
9°
10°
11°
12°
13°
14°
15°
16°
17°
U'BENA
Rufiji
MAGWANG.WARA?
WANDONDE?
Rufiji
Delta
Chooty I.
Kibondo I.
Simoya
Furu
Marengu
Kiapo
Kamanga
Songa
Panjonu
Mumpiana Mts.
KILWA KIVINJIA
Kibina Pt.
Kibwa I.
Mpuema
Muasi
Multapunda
KILWA KISSEWANI
Pemba I.
Jongo Mnara I.
Ruvuma Bay
Kisimbary I.
Mikindany Bay
Delgado
Tongaty Bay
Tikoma I.
Lindi
Lindi R.
Mitumbati R.
Mungutho R.
Pemba
Pimlea I.
Mandeiro
Mossuna
Tandahara
Ruvuma
C. Ruvuma
Hambezi Bay
Diidi
Chidia I.
Pioneer's farthest (Lov. 1861)
Sangaji Pt.
Maiyapa Bay
Portuguese Settl.
Moluro R.
Amaza I.
Morangoy Pt.
Quisi
Niumbu I.
Mutuneo I.
R. Mazimba
R. Casamba
R. Mossolo
Quitaraya R.
Tassene R.
Mussi
I. des Mattes
Penguin
Pt. Bungane
Matemo I.
R. Quirinusi
R. Cremacoma
Pt. Quisanga
Montepez R.
Querimba I.
Ibo
Pt. Ibo
Pt. Quiranga
Ibo
Pemba Bay
Macaloe
Malberi R.
James Pt.
Badgely Pt.
Lucio R.
Lurio R.
Seriea Pt.
Almeida B.
Fave Pt.
Mozangui R.
Sangome B.
Saluca Pt.
Sonove R.
Tembo R.
Mozambique
Fernando Veloso
Quisimajula
Conducia R.
Port Conducia
Mozambique
Pt. St. George
Rumonia R.
Mogincale
Barracouta R.
Mogincale Shoal
Huddart Sh.
Carroe
Antonio R.
Sangaje
Angoxa R.
St. Antonio I.
Matamede I.
Angoxa Pt.
Walker I.
Hurd I.
Caldeira I.
Mecufi
Mecufi R.
Mecufi Is.
Angoche
Mecufi
Macalonga Pt.
Epidendron I.
Casuarina
Mouths of Quisungale
Fogo I.
Sirne I.
Maxemba R.
Tijungo R.
Mt. Muaze?
Mt. Ockburn
Mt. Milanje (8000 ft.)
Mt. Clarendon 6000 ft.
Mt. Monasomba
Mt. Manguru
Mt. Makanga
Mt. Mlanje
Mt. Nkuje?
Mt. Lupapa
Mt. Maramba (1875?)
Mt. Linaca
Mt. Luzilo
Mt. Liyumbi
Mt. Mjungela
Mt. Miewire
Mt. Lukumde
Mt. Ngoko
Mt. Shukela
Mt. Zomba
Mt. Perindi
Mt. Nkore
Mt. Mpingo
Mt. Lisemba
Mt. Lipindudzi
Mt. Chiwoma
Mt. Lichemba
Mt. Liuzi
Mt. Mtiwa
Mt. Mtiwa
Mt. Mtiwa


Blantyre
Angoni
Mt. Milanje (8000 ft.)
Mt. Monadomba
Mt. Clarendon
Mt. Ockburn
TETE
MANGANJA
Zingesi
Vunga Hills
Nadau
Goto
Lobola
Lokole Hills
Luenya R.
Bonga
Mozambique
Bandai
Lake Nyassa
Mt. Rosere
Shupanga
Pambona
Dambo
Tingane
Mt. Manguru
Mt. Saddle
Matawe
Murimas (Shikanda)
Pinda
Mt. Makanga
Mt. Morumbola (4000 ft.)
Waita's (A chief or tributary to the Mashona)
Mt. Bismarck
Shombi's
King William's Goldfield
Chihombe
Maquatsie
Ganyana
Mt. Matike
Sanguru
Macombe (Chief of Barka)
SENNA
Nyanja Pongwe (Lake)
Bororo
Shame (Steckade)
Sasuny
Sham waraui
Kaia
Gorongoza Mt.
Sirungoma
Mazambe
Madlen Umpire (Hill of Cattle)
Sakatoko ruins
Vanteema
Kambira
Watua
Umtigesa
Baines 1870
Mashona Mts.
Aruangua
Mt. Moroz
Manica
Nyamonga Mt.
Shupanga
L. Nyatungo
Nakoonea
Niakuepa I.
Hinebiai
Queua I.
Expedition to Nyangombe
Pt. Palmyra
Thornton R.
Samatave
Tendaculo
Buda
Musselo (Timbue) R.
ZAMBESI (E. Lusho R.)
Kamsara & Gamango R.s
Indian R.
Lindi R.
Matindo R.
QUILIMANE
Quilimane R.
Tongalane Pt.
Pequena I.
Carango
Mutango
Inhasunge
Inzora
Mangara
Mambuedza
Nzandza
Lucuta or Mariner R.
Luaia R.
Mavuri R.
Pangasi R.
Mutuo
Langwe R.
Shuara
Lupata
Rowa
Inhasonbe
Muasi
Sabora
Mavuzi
Tchuma R.
Tchuma Escarpment
Umfuli
Umgezi
Mazoe
Luia
Lubanga
Lunga
Lue
Mutua
Mpandwe
Chitapso
Salumbiwa
Mchelongwe
Pusimbwiwa
Namakaso
Mcanga
Chibisa
Namakaukau
Chore
Monkolowa
Nyanja-Mucuru (Mr. Marsh)
Mororo's & Pakamwinga's grap
Mola I. (Bishop Mr. Kenzie's grave)
Gamba
Tsuro R.
Nyangwina
Pangani R.
Nyamo
Nyakoba
Mutanga
Sandi R.
Mutanga
Mpanga
Mozambique
Lake Nyassa
Mt. Zomba
(1st ascd. 1856)
Shire R.
Ruo
Ruo R.
Nyampungo
Mt. Chiradzulu
Mt. Mlanje
Mt. Zomba
Mt. Chiradzulu
Mt. Mlanje
Mt. Clarendon
Mt. Ockburn
Mt. Monadomba
Mt. Milanje (8000 ft.)
Mt. Bismarck
Mt. Matike
Mt. Morumbola (4000 ft.)
Mt. Makanga
Mt. Manguru
Mt. Moroz
Gorongoza Mt.
Nyamonga Mt.
Mt. Rosere
Mt. Saddle
Mt. Matawe
Mt. Shirimba Dambo
Mt. Shankungusi
Mt. Namatobet
Mt. Shimbrai Hill
Mt. Zomba
Mt. Chiradzulu
Mt. Mlanje
Mt. Clarendon
Mt. Ockburn
Mt. Monadomba
Mt. Milanje (8000 ft.)
Mt. Bismarck
Mt. Matike
Mt. Morumbola (4000 ft.)
Mt. Makanga
Mt. Manguru
Mt. Moroz
Gorongoza Mt.
Nyamonga Mt.
Mt. Rosere
Mt. Saddle
Mt. Matawe
Mt. Shirimba Dambo
Mt. Shankungusi
Mt. Namatobet
Mt. Shimbrai Hill
A SK
OF THE CO
LAKE
Scale of
20 10 0
32°
33°
30°
35°
Longitude East 36° of Greenwich
37°
38°
39°
16°
17°
18°

K. Johnston



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rities on earthquakes on the west coast of South America are Acosta, Molina, Ovalle, Llano y Zapata, Unanue, Bouguer, Ulloa, Humboldt, Meyer, Darwin, and FitzRoy. The phenomena of some of them have been very carefully observed.

1570.—An earthquake is recorded by Molina, at Santiago and Valparaiso in Chile, accompanied by land slips and a great wave.

1578. *June* 17.—An earthquake at Lima.

1581.—Acosta (Lib. III. cap. 27) says that Chuqui-apu (La Daz) was ruined.

1582.—A great earthquake at Lima and Arequipa.

1586. *June* 9.—A violent earthquake at Lima, extending far down the coast. An immense wave inundated the country for two leagues inland.

1600.—An earthquake at Arequipa, with a thick rain of ashes lasting for twenty days.

1609. *Nov.* 17.—An earthquake felt at Lima and Arequipa.

1630.—An earthquake at Lima.

1647. *May* 13.—Molina records an earthquake on the Chilian coast

1651.—An earthquake all along the west coast.

1655. *Nov.* 13.—Lima was much injured by an earthquake.

1657. *March* 15.—A violent earthquake at Santiago.

1658.—An earthquake at Concepcion.

1660.—An earthquake at Arequipa.

1667.—A great earthquake at Arequipa, and a violent eruption of the volcano.

1678. *June* 17.—An earthquake at Lima, and to the northward. The sea receded and returned with great violence.

1682. *Oct.* 19.—An earthquake at Lima.

1687. *Oct.* 20.—An earthquake at Lima, with a great wave which destroyed Callao. First shock at 4 A.M. Second at 6 A.M. (See *Philosophical Transactions for* 1694, p. 70.)

1688. *Oct.* 10.—Earthquake at Lima.

1690.—Earthquake at Lima.

1697. *Sept.* 29.—Very violent earthquake at Lima.

1698. *June* 19.—Earthquake round Quito. The summit of the volcano of Carguariazo fell in, streams of sand and water flowing from it. Hambato and Llactacunga were ruined.

1699. *July* 14.—Earthquake at Lima.

1709. *March* 20.—Earthquake at Lima, preceded by explosive noises.

1710. *April* 15th to *Jan. 1st*, 1711.—There were 14 earthquakes, preceded by subterranean noises, on the Peruvian coast.

1716. *Feb.* 6.—Earthquakes injured Lima and Arequipa.

1722. *May* 24.—An earthquake at Santiago.

1725. *Jan.* 9.—Earthquakes at Lima and Arequipa.

1730.—Earthquake and great wave at Concepcion.

1732.—Earthquake at Lima.

1734.—Three severe earthquakes at Lima.

1742. *May* 9.—Earthquakes at Lima and Santiago. The first shock lasted nearly a minute, followed by many more shocks up to the 10th.

1743. *Oct.* 14.—Earthquakes at Lima and Arequipa, preceded by much noise.

1746. *Oct.* 28.—The great Lima earthquake. There had been much subterranean noise for some days previously. The first shock was at 10.30 P.M., and lasted four minutes. In the following twenty-four hours there were 220 shocks. Lima was almost entirely ruined, and 1141 people were killed. Callao was overwhelmed by a vast wave, and out of a population of 5000 souls, 4800 perished. The wave is said to have risen to 80 feet. It carried the Spanish frigate, 'San Firmin,' right over Callao, and she was stranded nearly a mile inland. Out of twenty-three vessels at anchor, nineteen were sunk. Part of the coast was submerged, and a bay was formed. The ports of Cavallos, Guanape, Chancay, and Huara were also overwhelmed. Near Lucanas, in the Andes, a mountain opened and hot water came forth. The same thing happened in Pataz. The shocks continued until February 1747, and altogether there were 450 shocks.*

1751. *May* 24.—An earthquake at Concepcion, extending to Juan Fernandez.

1755. *April* 28.—An earthquake at Quito.

1760. *April.*—An earthquake at Truxillo, in Peru.

1760. *Dec.* 28.—A severe earthquake at Lima.

1762. *Dec.* 3.—An earthquake at Chile.

1784. *May* 13.—An earthquake at Arequipa.

1795.—At Tarapaca, in Southern Peru, there were forty shocks in one day.

1796.—An earthquake at Copiapa.

1797. *Feb.* 4., 7.45 A.M.—A violent shock at Riobamba, in the Province of Quito. The volcano of Tungaragua was the centre of disturbance, and the earth was shaken for 40 leagues from south to north. The earthquake was perceptible for 170 leagues, from Piura to Popayan, and 140 from west to east, from the Pacific to the River Napo. The first shock is said to have lasted for nearly four minutes, and the shocks continued at intervals until April 5th. Flames and vapours issued from a lake near Llactacunga, there were loud subterraneous reports, and great clefts were opened round the volcano of Tungaragua. The town of Riobamba was destroyed, and 30,000 souls perished. The vertical action of earthquakes showed itself here in a remarkable way. Corpses of people who perished were hurled to a height of several hundred feet on the hill of La Cullca. (*Humboldt. Cosmos* I. p. 191.)

1806.—Severe shocks at Lima.

1818.—A series of heavy shocks at Tarapaca during fifteen days. Also at Copiapo.

1819. *April* 3, and on the 4th and 11th.—Copiapo destroyed.

1820.—Coquimbo nearly destroyed, but the shocks were quite local.

1822. *Nov.* 4.—Severe shocks at Copiapo and Coquimbo.

1822. *Nov.* 19, 10.15 P.M.—Severe shocks, extending down the Chilian coast to Concepcion, and inland to Mendoza. The centre of disturbance was a few miles from Valparaiso; for, north of that port, the shocks came from S.W., and south of it, from N.W. Violent shocks lasted for half a minute during the whole night. The first three were most severe. The shocks continued at intervals until September 1823. At Valparaiso there was a great wave. Melipilla, Quillota, and Casablanca were destroyed.

1823. *Jan.* 15.—Severe tremblings at Santiago.

1824. *Aug.* 29.—Earthquake at Santiago.

1825. *June* 12.—Earthquake at Santiago.

1826. *April* 22.—Earthquake of Santiago.

1827. *May* 30.—Violent shocks at Lima. The first at 7.32 A.M. Also at Santiago.

1828. *March* 30, 7.32 A.M.—Severe shock at Lima and Callao, felt also at Arequipa to the south, and Truxillo to the north. It seemed to be passing out from the Andes to the sea. The shocks at Lima lasted twenty-nine seconds. They were felt on board the 'Volant.'

1828. From *April* to *August.*—Numerous severe shocks at Santiago.

1829. *Oct.* 26.—Violent shocks, but of short duration, at Santiago and Valparaiso. Many houses were destroyed, and Casablanca was entirely ruined.

1831. *Oct.* 8.—Earthquake at Arica, extending to the southern frontier of Peru, and north as far as Camana, over 420 miles. The first shock was at 9.30 A.M., coming from south to north, followed by others at 11 P.M., and 5 A.M. There were ninety-seven minor shocks up to Feb. 7, 1832. This earthquake was felt 100 miles out at sea.

1832. *Dec.* 31.—An earthquake at Huasco in Chile.

1833. *Sept.* 18.—An earthquake at Arica.

1835. *Feb.* 14.—Slight vibrations at Santiago.

1835. *Feb.* 20.—First shock 11.30 A.M.: felt all over Chile, and at Juan Fernandez. There were three oscillations from Chiloe to Copiapo, the second and third being the most violent, from S.W. to N.E. Between Feb. 20th and March 4th there were 300 shocks. The sea retired twice, and came back in enormous waves, and there were two eruptions from the sea. Great fissures were formed, and the coast was elevated several feet. This earthquake was observed and reported upon by Darwin.

1835. *Nov.* 11.—A severe earthquake at Concepcion. The volcanos of Osorno and Corcovada were in violent action.

1837. *Nov.* 7.—A violent earthquake and great movement of the sea, on the Chilian coast. Valdivia ruined.

1847. *Jan.* 19.—Earthquake at Copiapo.

1861. *March* 20, 8.45 P.M.—A great earthquake at Mendoza, on the east side of the Andes. The first shock destroyed the town, killing 16,000 people. In the following ten days there were eighty-five shocks coming from S.E.; but they were not felt in Chile. Showers of ashes on the Uspallata Pass.

1868. *Aug.* 13.—A fearful earthquake, which nearly destroyed Arequipa, and levelled the cathedral. Tacna also

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* *A True and Particular Account of the Dreadful Earthquake at Lima on the 28th of October* 1746, published at Lima by command of the Viceroy, and translated from the original Spanish. (London. 1748. Pp. 341.)

There is another fuller account by Llano y Zapata, reprinted in the *Revista de Lima* for April-May 1860, and edited by Don Manuel Z. de Peralta.

suffered. A great wave rushed upon Arica and landed the American steamer 'Wateree' high and dry. Iquique was also ruined. Altogether 25,000 lives were lost. Shocks continued until Aug. 15. A sum of 11,000*l.* was collected in London for the sufferers.

1873. *July* 7.—Earthquake at Valparaiso, the oscillations from N. to S., confined to the seaboard and 30 miles inland. 2.20 A.M., a violent and prolonged shock, which brought down many houses. (See *Geographical Magazine*, Oct. 1873, p. 300.)

1875. *Dec.* 4.—A severe earthquake, with thirty-seven shocks, reported at Abancay, in the interior of Peru. (See *Geographical Magazine*, March 1876, p. 78.)

The dreadful earthquake of May 9th, 1877, appears to have had its origin in the volcanic mountains near the frontier of Peru and Bolivia. Consequently it was most severely felt in the extreme south of Peru, at those promontories covered with guano deposits which we have described in former numbers. (Dec. 1874, p. 370, and May 1877, p. 125.) There were settlements formed upon them, and many ships at anchor waiting for cargoes of guano. At Pabellon de Pica, one of the largest guano deposits, there was a settlement called Chanavaya, consisting of 400 houses. At 8.25 P.M. of May 9th there was a severe shock, and every house (except two) was levelled to the ground. Huge boulders began to fall from the hills, and thirty labourers were buried in a guano cutting. Then a great wave, 35 feet high, swept over the ruins, and four more waves came in between 8.25 and 10.10 P.M. Meanwhile, the havoc was terrible among the shipping, and all the launches were destroyed. Seven ships were lost, others were much damaged by collisions, and the loss of life is placed at 200.

At Huanillos, another guano deposit, the cuttings fell in, and all the houses were destroyed. The ships 'Avonmore,' 'Geneva,' 'Conway Castle,' and 'Conference,' were sunk. The unfortunate master of the 'Avonmore,' Captain Corfield, lost his wife and children, though he himself was saved. At a third guano deposit, called Punta de Lobos, two vessels were lost and fourteen seriously damaged.

At the same moment all the southern ports were overwhelmed. Tocapilla was destroyed. At Cobija, in Bolivia, most of the houses were ruined, and a wave 35 feet high destroyed all the boats. The nitrate works between Cobija and Tocapilla were washed away; while the mine of La Peña Blanca, four miles south of Tocapilla, fell in, and 200 workmen were smothered. At Antofagasta the sea completely swept the town, and Mexillones also suffered.

The first shock at Iquique occurred almost at the same instant (8.22 P.M.). Shock followed shock, destroying the houses, and a fire broke out. Then a great wave poured over the ruins. The custom-house and all the nitrate stores are gone. The water condensers are ruined. All the warehouses have disappeared, and every boat is destroyed. Two vessels sunk. The damage is estimated at $1,605,000. At first there was a rumbling noise and a slow movement of the earth, followed by tremendous oscillations from S.E. to N.W. One shock lasted four minutes and twenty seconds without cessation, and there were two great tidal waves.

At Arica there were numerous shocks, the sea suddenly receded, and then a wave 75 feet high rolled in upon the shore. This was repeated eight times. The custom-house and many private houses were levelled to the ground. The wave extended farther inland than in August 1868. Four miles of railway embankment were destroyed, locomotives and rails were rolled about, and left in a confused heap of rubbish. The American steamer 'Wateree,' which had been stranded in 1868, was lifted up bodily and floated two miles north of her former position. All launches and boats were destroyed.

At Mollendo the railway was torn up by the wave for about 300 feet. But Arequipa escaped altogether, and there was only slight damage at Pisco. On May 14th there were severe shocks at Lima and Callao, felt also at Ancon, at 7.10 P.M. and 9 P.M. But, though there was much alarm, very little damage was done.

Thus, the earthquake coming from the south, spent its chief fury near its centre of origin, and gradually worked itself out as it went north. It also appears to have trended more to seaward than is usually the case with these meridional lines of disturbance. On the 9th, the Pacific Steam Navigation Company's vessel 'John Elder,' when 23 miles west of Antofagasta (lat. 23° 43′ S., long. 70° 47′ W.), and going full speed, was suddenly stopped as if she had struck a rock at 8.30 P.M., and remained stationary for five minutes. The sea was perfectly smooth, and there was no bottom at 20 fathoms. The steamer 'Eten,' anchored off Antofagasta, experienced a severe shock, and was shaken during two minutes from 8.30 P.M. At the same hour the steamer 'Coquimbo' felt a violent shock for fifty-five seconds, off Pisagua. The Tahitian brigantine 'Tawera' felt a severe shock on the 8th of May, at 4 P.M., in lat. 35° 30′ S., and long. 104° 52′ W.

The centre of commotion appears to have been the volcano of Llaga, near the frontier of Peru and Bolivia, which was in a state of activity, as well as San Pedro de Atacama. A red glare was seen in that direction from Antofagasta, and at Pabellon de Pica a peculiar light was seen in the western sky, during the earthquake. The Chilian coast escaped without injury, and the force of the earthquake was spent before reaching Callao.

The loss of life is placed at 600 souls, and the destruction of property at $20,000,000.

Creditably prompt steps were taken for the relief of the sufferers. The first who came to the rescue was Captain Clayton, of the Pacific Steam Navigation Company's steamer 'Atacama.' He took on board and supplied with necessaries 350 unfortunate people at Pabellon de Pica and Huanillos, 120 at Tocapilla, 80 at Cobija, and 320 at Mexillones. Supplies were sent both from Lima and Chile. The Peruvian Minister, Dr. Rosas, chartered the steamer 'Copiapo,' and put on board about 2000 packages of provisions by the 15th of May; and the Chilian steamer 'Abtao' went off with $752,536 worth of goods for the sufferers.

It would have been more to the credit both of England and Peru, if the 'Shah' and 'Huascar,' instead of hammering away at each other all the afternoon of the 29th of May, had also been engaged in conveying succour and relief to the hundreds of houseless and destitute families along the coast. As regards the guano settlements, where so many British vessels are constantly loading, the duty of relief belongs quite as much to England as to Peru.

The phenomena of earthquakes on the Pacific coast are very important, and should be observed more accurately and systematically than has hitherto

been the case. We believe that the best account of an earthquake wave was published by Professor Bache, at Newhaven, in 1856. The suggestions of Professor Perrey, in 1853, as to the connection between earthquakes and the moon's age, and as to the influence of currents of earth magnetism in producing earthquakes, should lead to the careful collection of more reliable data. Mr. Mallet came to the conclusion that no generalisation can be elicited from mere cataloguing of earthquakes. But he recommended observations at self-registering seismometrical establishments at suitable localities in earthquake regions; and he has pointed out the best methods of observing in his valuable paper in the Admiralty *Manual of Scientific Enquiry*. Hitherto, really accurate observations have only been obtained when such a man as Darwin has happened to be on the spot. It seems desirable, in the interests of physical geography, that a system should be established for the accurate observation of earthquake phenomena at the principal ports on the west coast of South America.

EXPLORATION IN PATAGONIA.

THE following interesting report has been received by the Minister of Foreign Affairs at Buenos Ayres, from the well-known Argentine Naturalist and Explorer, Don F. P. Moreno:—

"PUNTA ARENAS, *14th April, 1877*.

"In my first communication I gave your Excellency a general account of the results of my voyage from Buenos Ayres to the River Santa Cruz, and announced my speedy departure for the interior of the country. The preparations for this began at once; but since there were no Indians then in the neighbourhood who could supply me with the necessary horses, I was delayed for some time, and employed myself in short excursions. In one of these I went over a considerable portion of the territory comprised between the river and the Atlantic, as far as the Isla de Leones, part of which I had examined in 1874. Afterwards I went to San Julian, at which place I was told Indians might be met with; but on arriving there I found that they had moved westward; and since sufficient means of transport were not to be obtained, I was obliged to change my plans, and to follow their trail as far as the 'tolderias.' These were situated on the banks of a small river, which empties itself into the Rio Chico, not far from its embouchure in the Bahia de Santa Cruz. This is certainly the Rio Chalia which Viedma mentions in his diary, and which he believed to fall into the Santa Cruz. Captain Musters did not see it, but was of opinion that Viedma had crossed the Rio Chico twice, taking it for two distinct streams. This river, the course of which we followed for a distance of about 90 miles, flows in a wide and level valley, so little accidented that a railway might be made along it from the Atlantic to the foot of the Andes, at little cost. In parts it has very fertile levels, which might be used advantageously for pasturing small herds of cattle. The district in which the Indians live is named Shegueri, and from it the great Cordillera can be distinctly seen, with its perpetually snow-clad peaks. The friendly Tehuelches gave us three horses, in exchange for some provisions, and I was allowed to make a number of measurements of the stature of these people, who are, without doubt, the tallest of all the races on the globe. Having succeeded in the object of my visit, I returned to the mouth of the Santa Cruz, and set out again thence, on the 15th of January, in the direction of the source of the river. The expedition consisted of Sub-Lieutenant D. Carlos M. Moyano, three of the boat's crew, a man and a boy to take care of the horses, and myself.

"At the time of our outset the river was rising rapidly, and had already exceeded considerably the limit of highest flooding formerly known, so that the work of towing the boat had to be done on foot; on horseback it proved extremely difficult and dangerous in some places. The boat was exceedingly heavy and undermanned, the number having been arranged for a light skiff of half the size. All the expeditions before ours in which attempts were made to discover the sources of the Santa Cruz, were much better fitted out. In 1834 the expedition of Admiral Fitzroy comprised a number of officers and three boats, manned by eighteen sailors; but it returned after twenty-one days of hard work without having accomplished its object. The Chilian Commission, which recently attempted to ascend the Santa Cruz with a steam launch and two rowing boats towed by horses, returned to its mouth after ten days' travelling, having only traversed a small part of the river. The expedition which was sent in 1873 by the commander of the Argentine goleta 'Chubut,' in charge of Sub-Lieutenant D. Valentin Fulberg with a whale boat and four men of a crew, was the only one that reached the point at which the lake pours its waters into the Santa Cruz. There I found a document beside the remains of a flag, left by that gallant officer, who was prevented from exploring the lake by bad weather.

"The expedition which I have had the honour to direct has been more fortunate. With a boat measuring 28 feet, with only three men to work her, and after a month of almost continuous labour, in which we had to struggle against the velocity of a current which sometimes even exceeded 10 miles an hour, with many rapids, with an abnormally great flood, and with perpendicular barrancas, 200 feet in elevation in some parts, we reached the lake in which the Santa Cruz takes its rise, on the 14th of February. It lies in 50° 14′ 20″ S. lat., and approximately in 71° 59′ W. of Greenwich. Two days later we crossed it in the only boat that had ever floated on its waters. We spent several days in visiting the different portions of it, in making collections, and in taking a sketch survey of the lake. On one part of its shores we discovered an ancient habitation of some of the primitive people of Patagonia, and a partly mummified body was found beneath a scarped barranca. Unfortunately the windy season had already set in, and the heavy storms prevented us from taking the boat to the extreme west of this fine lake, which measures 30 miles in length from east to west by 10 miles at its greatest width, and which is profoundly deep, no bottom having been obtained with a line of 120 feet at two miles from the shore.

"The boat, which was a bad sailer, was not fitted for navigating the lake at this season, in which the winds raise a surf more terrible than that of the port of Buenos Ayres during a south-east wind. Having lost a considerable part of the provisions and of the

collections from this cause, I determined to continue the exploration on horseback. Two of the crew and the boy were left in charge of the boat, with the provisions which remained, and, with Señor Moyano, I set out towards the north, crossing a series of table-lands of tertiary formation, 2500 to 3000 feet in height, the summits of which were covered with large caps of basalt. In a little valley we met with the same Indians of Shegueri, who had come hither in search of 'baguales' (strayed animals): they hired to me three fresh horses, and one Indian offered to serve us as 'vaqueano' to the districts we were about to examine. We kept on in the same direction until we came upon the Chalia again, where it was flowing S.W., and, crossing it, we passed on N.W. until we reached a chain of little lagoons, surrounded by excellent pasture: the largest of them is 5 or 6 miles in length, and is called 'Far,' or 'dirty,' by the Indians, on account of the colour of its water. More to the west we discovered a hitherto unknown lake. Though of smaller dimensions and of different character from that in which the Santa Cruz rises, it is not less important. It lies surrounded by mountains of 3000 to 5000 feet in relative elevation, most of them volcanic, with their summits covered with snow, and with abundant wood on their sides: it appears to form part of a lake of still larger extent, to judge by the report of the Indians, who from the summit of a hill have seen a 'much larger water' in the west. Although little reliance can be placed on the statements of the Indians, I believe that the larger lake exists, since we saw a wide channel in that direction separating two folds of the sierras, behind which we could perceive a great bay or hollowing in the base of the range of the Cordilleras. Through this channel large masses of ice float into the lake which we saw, and some of these, broken into huge fragments, had been driven ashore close to the place where we camped. The latitude observed there was 49° 12′ S. Since it has remained quite unknown to any of the travellers who have hitherto visited Patagonia, and since it has no Indian name to distinguish it, I have called it the Lago *San Martin*, as a humble tribute to the memory of the illustrious Argentine General.

"Finding ourselves quite without supplies, and reduced to quarter rations, and with tired-out horses, I returned to the 'Far' lagoon. Thence we continued south by a narrow valley, but one which abounds in good cattle-pasturing spots, irrigated from point to point by permanent streams—among these that of the Chalia which rises somewhat farther to the west among the mountains, where it gathers from little torrents. After crossing the summit of a basaltic plateau of considerable elevation, we reached the lake discovered by Don Antonio de Viedma in 1782, and whose name it bears. The name 'Capar,' under which it appears on the maps, is not Indian. Perhaps it is a corruption of 'K'char,' an Indian halting place or camping ground on its shore. Viedma's lake is the largest that I have seen in Patagonia. It extends as far as the foot of the Cordillera, where it is fed from the snow-drifts, and has its greatest length in a W.N.W. direction, the head of it being closed by the magnificent volcano of Chalten, which is in activity. At a moment when the clouds cleared off, and allowed the bold cone to be seen, a light column of smoke was also visible ascending from the crater. Afterwards from other points of view, I frequently noticed a large smoke cloud in this direction, and the Indians said it was from the Chalten. They say that it throws out ashes and smoke only.

"We traversed the eastern and part of the southern shores of Lake Viedma, until we found the way barred by a river of 200 yards in width by which the two lakes communicate. The point at which this flows out of Viedma's lake is in lat. observed 49° 48′ S., and that at which it enters the lake which supplies the Santa Cruz, is in 50° 11′ S. This is the river that Viedma took to be the Santa Cruz, being unaware of the existence of the other lake to the south of it. I have called it the 'Rio Leona,' in remembrance of an attack which we experienced from a puma in its vicinity. From this point we returned to the place where we had left the boat.

"A few days later we crossed the Rio Santa Cruz, and, leaving the boat and the crew behind, I went westward, accompanied by Señor Moyano and one man, to examine the extremity of the lake. We rode as far as the woods permitted, and then continued on foot, leaving the man in charge of the horses. The way was extremely difficult on account of the vegetation and the roughness of the ground, and we were delayed at every step. Little torrents were very numerous—we crossed at least eighteen of them. We skirted a height at the foot of which flowed a broad channel which communicated with a smaller lake situated farther south, but these two may be considered as almost one. Where the mountain became so completely precipitous that it was impossible to advance farther, I left a document attesting our nationality, and the Argentine flag at the side of a large boulder rent by the frost from the neighbouring snowy heights. The 'Argentine Lake' (a name which I have given to it since those who first reached it and discovered that it was quite distinct from Viedma's lake), had several huge ice islands floating in it at the time of our visit. One of these, of great dimensions, and rising apparently about 70 feet above the water, floated about for nearly a month; but during the last days of our stay the heat was very great, and we were sorry to see this huge berg, which we had admired for so long a time, broken up and scattered in fragments about the lake. The melting of the snows in the Cordilleras was then so great, that the Rio Santa Cruz had risen 63 feet on the 17th of March. Since provisions for a very short time only remained, and as it was impossible to use the boat now against the current, we turned to go down stream. In twenty-four hours we descended the distance that had taken us a month to ascend. Owing to the great flooding, the current was much more rapid even than when we came up. In some parts the river was now a mile wide, and the least depth noted in the channel was 30 feet. In other parts the sounding line showed as much as 70 feet, up to 84 feet. At some moments it was impossible to control the boat, in consequence of the great eddies caused by the current, and some passes were quite dangerous. In other reaches the boat flew along at 15 miles an hour. An extended report upon the examination of the regions we have visited must be left till my return. I have made some collections, and have examined the extensive tertiary formation

which extends as far as the Cordillera, and I have gathered some interesting fossils. The immense quantities of erratic blocks, some of them 500 cubic yards in bulk, are also interesting. Some of them have been dropped about the Bahia de Santa Cruz, where they reach a cubic yard in size; others are scattered up to an altitude of 2000 feet in the table lands close to the Cordillera. The Rio Santa Cruz may be considered navigable for steamers drawing 12 feet of water, but these would require to be of great power. By means of the rivers, if the exigencies of the inhabitants of these regions should ever require it, the country could be crossed as far as the Andes.

"In Santa Cruz I left the boat and the men in charge of the collections, till they can be sent to Buenos Ayres, and I reached this place on the 12th inst. (April). Having fulfilled the pleasant duty of announcing to your Excellency that the 'Plains of Mystery' of Admiral FitzRoy have ceased to correspond to their name, it only remains for me to commend to you my companion, D. Carlos M. Moyano, who shared with me all the good and bad fortune of the expedition. "F. P. MORENO."

THE INDIA-RUBBER TREES IN BRAZIL.

(Continued from page 187 of our last number.)

Observations relating to the Rubber-producing Tree of Central America.—I will now add a few remarks concerning this tree, which I collected in the interior of the Isthmus of Panama towards the latter end of 1875—this, because I think it has not received the attention it deserves. There are now a good collection of plants at Kew, and I am surprised that more have not been sent to India.

The tree inhabits wooded regions near Guayaquil and Buenaventura, and has likewise been met with abundantly in the State of Panama, and in the Republics of Costa Rica, Nicaragua, Honduras, Guatemala, and Mexico. It is one of the largest and most massive of the trees of Western tropical America. The trunk often attains to a surprising thickness and height, yielding in some instances above a hundred pounds of india-rubber. The wood is extremely soft, and, when cut into, decays rapidly. The destructive method of cutting down the tree to be tapped has exhausted extensive rubber localities, and, although others may be opened up, yet the supply is certain to diminish at no distant date. Even where the trees are not felled, as in Nicaragua, the method of tapping—by which the wood is injured—is so unskilful that it has been considered by some as preferable to cut the tree down at once. The climate of various of those rubber districts is hostile and severe, and some places, such as the forest regions of Buenaventura and Chocó have no parallel in the universe. Throughout the State of Panama drenching rains are almost of daily occurrence, and occasionally, on the Atlantic side, hurricane blasts make avenues in the forest. The district investigated by me, and where the plants were collected, was reached by ascending for some distance the river Chagres, and then travelling for several miles through a stately forest into the heart of the isthmus. The trees seen exceeded in height and dimensions those met with in the wooded districts of the Amazon. An undergrowth of a thorny, wild pine apple (*Bromelia*), 10 feet in height, everywhere formed extensive thickets. Large powerful snakes were numerous and so audacious that they deliberately rose up to strike at any one that approached. The young rubber saplings were found growing most abundantly on the banks of cool, clear running streams and little dribbling rivulets. The roots could easily be traced over the surface of the ground, running down to the very margin of the water. But the tree grew also on eminences, steep declivities, and varied elevations, and in such abundance that the first explorers gave the name "Caoutchouc Hill" to a height which they found crowned with a forest almost entirely composed of rubber trees. It was not seen growing anywhere on swamp or marsh land. Although the rubber districts are proverbially rainy, yet the tree was seen by me growing beside a stream on the border of a desert tract of country bounding the Gulf of Guayaquil, where only a few light showers of rain fell during the year. On both sides of the stream there was a strip of good forest, but, beyond, thickets of cactæ and low, spreading legumes formed the characteristic vegetation. I mention this fact to show that the tree will probably succeed well in regularly-irrigated districts, even if the atmosphere be dry and dusty. The temperature in the woods of the isthmus ranged from 75° to 88° Fahrenheit. Rain water, examined the moment it fell, was never found to be below 74°. The usual practice in collecting the milk was by felling the tree and then making deep notches around the trunk, at distances not exceeding 1 foot apart. Broad leaves were placed beneath these to receive the milk, which afterwards was collected in a large calabash or other vessel. A hole was then dug in the ground, and the milk poured into it and thatched over with leaves. It coagulated in about two weeks. Another method was to bruise a handful of the large, broad, heart-shaped leaves of a climber—a species of *Ipomea*—and stir these about in the milk. By this operation the milk thickened, in less than an hour having the appearance of a jelly-like mass, but very porous, and exuding profusely a black ink-like water whenever touched or moved. This system of preparation produces an inferior article, and I have seen some buyers from the United States cut up the large juicy flakes into slices an inch or so in thickness and dry them in the sun. The temperature of the sea water along the west coast, where the rubber tree grows, is high, and does not vary much during the year. In the Gulf of Guayaquil it is usually 78°, at Buenaventura 80°, and in the Bay of Panama 79°. The water of the River Chagres, although 80° in fine weather, falls during violent rains to 76°. On such occasions many fish are to be seen in certain places floating about in the water, benumbed like, or dying. I do not know if this is the result of the sudden lowering of the temperature, or if it is to be attributed to the great quantity of decayed vegetable matter brought down by the discoloured swollen torrents from the interior of the forests.

In India there are many districts which possess all the climatic conditions necessary for the successful cultivation of central American rubber. From Bombay, southward, the majority of the deep debouches of the Ghauts coming from the base of the western slope of the Malabar hills, including the

humid forest region, extending in places down towards the coast, contain many excellent sites. In Ceylon and southern Burmah and the Malay peninsula, the tree is likely to thrive in all proper situations. Calicut is about in the same latitude as the centre of the region occupied by this rubber tree in its wild state. The deep recesses of the Sispara Ghaut, really, closely resemble some of the caoutchouc districts adjoining the River Dagua. The sites selected ought to be at low elevations, and no place should be tried where the temperature at any time during the year falls below 60° Fahrenheit. Marsh land must be avoided. In dry desert localities the tree may be expected to do well when planted along the banks of canals or any description of channels where water is flowing for the whole or a portion of the day. Trees in good situations will produce seeds early, but these will require to be planted without delay, as drying destroys their vitality. But cuttings must be resorted to first, and stout branches cut into pieces, each possessing a bud and covered lightly with soil, will generally be found to grow. Strong cuttings a foot in length and furnished with buds, when planted in the usual way, will become strong plants sooner. However, the propagation of this tree will not be found so easy as the Ceará rubber.

In the planting out of young plants, the petiole, or leaf-stalk, of the lowest or oldest leaf, should be buried in the soil. By following this simple rule, the plant commences to grow at once, its growth is vigorous, and the trunk symmetrical. But if at the period of planting there is much bare stem above ground, then growth is usually slow, the plant remains "leggy" for some time afterwards, and never makes a good tree. If the plants get a little attention until they are four or five feet in height, I do not think there is any description of weeds or forest growth in India that will afterwards overtop them. The rapid growth of this tree, by which a large amount of vegetable mould is added to the soil, is an important feature. My own opinion is, that if planted in suitable places, and properly wrought, it will be found to yield a larger return per acre than any other plant or tree cultivated in India.

Concluding Remarks.—In commencing the cultivation of these trees in India, it may be well to ascertain by actual experiment, as early as possible, the species likely to yield the largest amount of caoutchouc. It is possible that as regards quality there may be little, if any, difference in the milk of the various kinds, when collected and prepared in the same way. As has been already stated, each of the three sorts require rather different sites, a wet or swampy situation being most natural to the Pará tree, while the moist banks of rippling streams or rivulets will be found well suited for the species from Panama. The Ceará tree is not delicate, and will grow and produce rubber in situations where other kinds, if planted, would be dried up. For these reasons it is likely to prove a valuable plant in India, in parched up regions and stony, unproductive lands, thinly covered with soil. The cup method, if employed in an extended way, may be found a convenient mode of tapping. Thus, twenty rows of cups, distributed over the entire trunk, might be put on at one time. The earth could also be cleared away from underneath the large roots, to allow of their being properly tapped. Even by the rude method adopted in South America—by which the wood is much hacked—the roots are found to yield milk abundantly, at all seasons, of excellent quality. But whatever method is adopted, it is evident that if care is exercised, tapping may be carried on continually. The Pará tree in many localities gets no rest, except during a very "wet moon," or when the collectors are drinking *cachass*. Therefore the idea of giving the trees one or two years' rest ought not to be entertained. The Ceará method of paring off the surface of the bark might be tried on any of the sorts in dry weather.

Pará and Panama trees may be tapped on attaining a diameter of, say, 6 or 8 inches, and that of Ceará with a diameter of 4 to 5 inches. A collector in a plantation, working with cups, should be able to collect easily from eight to ten pounds of rubber per day. On the Amazon, in newly opened districts, where the trees have not been operated on before, practised hands are sometimes able to collect from 20 to 30 pounds daily. A much greater quantity may be collected in even a shorter time on the Isthmus of Panama and adjacent regions; but then the trees are cut down to obtain the milk—a plan which, it is assumed, will not be followed in India. The cup process of tapping, the most general in use in the Amazon Valley, is an Indian method, and is said to have been in use amongst them at the time America was discovered.

No time should be lost in reducing the milk, when collected, to a solid state; for if this matter is delayed, decomposition takes place, which furnishes much of the impurity complained of by manufacturers. If possible, the milk should be coagulated on the day it is collected. The milk of some species, such as that of the Panama rubber-tree, may keep for a week or more in a cool, shady place; but Pará rubber milk spoils within the space of twenty hours, and gives off a most disagreeable odour. All the Pará rubber is prepared by the smoking method I have described. Where nuts cannot be easily found, green foliage is used instead. The "fumes of sulphur," "ammonia," or "acetic acid" are never employed. Alum is generally used in thickening the "mangaba" milk in the south of Brazil, but it appears to destroy the elasticity of the rubber. The watery portion may be evaporated by placing the milk, in small quantities at a time, in shallow vessels attached to any simple form of hot water apparatus. Either this, or the adoption of a smoking method similar to that of Pará, will probably be found the best. The material should be prepared in thin flakes, about 1½ inch in thickness. These pieces, if made square in the form of a bale, could be fastened together, and covered with coarse cloth. In this way rubber would be both easily handled and stowed.

The milk of *Masseranduba* (*Lucuma procera*), and of one or two milk-yielding trees of the Amazon districts, reported to be mixed frequently with Pará rubber, possesses no elasticity when prepared separately.

The island of Borneo has been suggested to me as a place specially suited for the formation of india-rubber plantations. No doubt they would grow there as well as in India, but probably not any better. Although the position in point of latitude may appear in favour of Borneo as regards the Pará tree, I doubt

if the climatic conditions of that island excel in any particular the southern portion of the Madras Presidency at low elevations. It must be remembered that what is termed by some the "equator of heat" is considerably to the north of our geographical equator. On the American continent it may, I think, be placed at not less than 10° of North latitude. In the dense forest regions of the Amazon and Panama isthmus the most striking feature is the extraordinary development of certain trees occupying large spaces of ground, chiefly *Ficus* and *Bomba*, mantled by a dense profusion of leafy climbers, the trunks and branches clothed with parasitical plants. In India, as, for instance, in the best forest portions of the Sispara Ghaut, there are no conspicuous large trees with buttressed roots, but there is a far more even development of general forest trees; and I have no doubt if an acre of such land was cleared, and the wood thereof weighed, it would be found to equal, if not exceed, the product of a similar extent of ground in the wooded districts of tropical America. Apart, however, there remains a more positive proof of the capabilities possessed by the climate of Southern India. The cocoanut and mango trees can only be cultivated in the hottest regions of the tropics. Now, I have visited places where these trees were planted by the natives, such as Jamaica, Hayti (St. Domingo), Porto Rico, Santa Martha, Carthagena, Panama, Buenaventura, Tumaco, Bahia, Esmeraldas, Guayaquil, and Pará, but nowhere was the fruit superior, nor hardly so large, as the mangos or cocoanuts of the Malabar coast. For these and other reasons I have confidence that there exist the necessary conditions for the successful cultivation of the American rubber-yielding trees in many parts of India.

Robert Cross.

Iter Persicum; ou, Description du Voyage en Perse entrepris en 1602 par Etienne Kakasch de Zalonkemeny, envoyé comme Ambassadeur par l'Empereur Rodolphe II. Traduction publiée et annotée par *Ch. Schefer*, Premier Secretaire interprête du Gouvernement. (Paris, 1877.)

This is a valuable addition to our knowledge of the history of the reign of Abbas the Great, the most illustrious sovereign of the Sufawi Dynasty of Persia. The motive of sending Zalonkemeny on this mission to the Persian Shah was connected with the preponderating influence obtained by France in the counsels of the Porte. Francis I. sought the alliance of the Ottoman Sultan after the Treaty of Madrid. The alliance was maintained by his successors, and the Austrians consequently strove to strengthen their power by alliances with the enemies of the Turk. Shah Abbas sent Sir Anthony Shirley on an embassy to the European powers, and he was honourably received by the Emperor Rudolph II., at Prague, in 1600. The Emperor then determined to send an envoy to the Shah, and Zalonkemeny was selected for the post. He took as his secretary a German named George Tectander von der Jabel, who, on his return, wrote the *Iter Persicum*. The work was excessively scarce, so that M. Schefer has earned the thanks of all students of Persian history by bringing out the present excellent edition. The narrative contains an interesting account of Shah Abbas and his court, of his campaign against the Turks, and of his conquest of Tabriz; besides a curious picture of Russia and its court at the commencement of the seventeenth century. M. Schefer has added many valuable notes, and a bibliography of the reign of Abbas, including much information respecting the embassies of the Shirleys.

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On the Birds of the North Polar Basin. By *Capt. H. W. Feilden, C.M.Z.S.* (*Proceedings of the Zoological Society*, Jan. 16, 1877.)

In this interesting paper, the Naturalist of H.M.S. 'Alert' draws attention to the distribution of bird life along the shores of the Polar Basin, between latitudes 82° and 83° N., the most northern land ever yet visited by human beings. On the day of reaching the latitude of the 'Alert's' winter-quarters, in 82° 27' N., Captain Feilden saw seven or eight long-tailed ducks (*Harelda glacialis*) on a small piece of ice, a fine glaucous gull (*Lærus glaucus*), and a single dovekey (*Uria grylle*) flying south. On September 5th, 1875, Captain Markham came across eleven eider ducks at Dumb-bell Harbour, in 82° 30' N., and saw a single turnstone. On Sept. 19th a pair of long-tailed ducks alighted in a pool near the ship, and on the 29th a ptarmigan was seen in winter plumage. Captain Feilden saw a snowy owl seated on the top of a hummock about a mile from the ship on October 2nd. After this date no bird was seen for five months. On March 11th, 1876, three ptarmigan were seen, and on the 29th Lieut. Parr saw a snowy owl. On the 13th of May Captain Feilden heard the note of the first snow bunting (*Plectrophanes nivalis*), as he was lying in his tent at the base of a cliff. The note came from above, clear and musical. Every inmate of the tent started into a sitting posture, and said—"Hush! hush! do you hear it?" One of the sailors said to Captain Feilden—"What bird is that, sir? It is sweeter than a throstle" On May 27th Lieut. Parr met a straggling snow bunting near 83° N.; so this species can claim for itself the highest northern range yet recorded of any bird. On June 5th, whilst travelling in 82° 33' N., Captain Feilden observed the first knots, sanderlings, and turnstones, and a flock of brent geese passed over his head. On June 6th he noticed the first long-tailed skuas (*Stercorarius longicaudatus*), and on June 24th the first king duck (*Somateria spectabilis*). Altogether, sixteen species were met with on the shores of the Palæocrystic Sea, namely:—

1. *Nyctea scandiaca* (snowy owl). Found breeding. Feed on lemmings.
2. *Plectrophanes nivalis* (snow bunting). Breeding.
3. *Lagopus rupestris* (ptarmigan). Ten brace killed.
4. *Strepsilas interpres* (turnstone).
5. *Calidois arenaria* (sanderling).
6. *Phalaropus fulicarius* (phalarope).
7. *Tringa canutus* (knot). Breeding.
8. *Sterna macrura* (Arctic tern).
9. *Lærus glaucus* (glaucous gull).
10. *Stercorarius longicaudatus* (skua).
11. *Procellaria glacialis* (fulmar).
12. *Uria grylle* (dovekey.)
13. *Colymbus*. Species unknown.
14. *Harelda glacialis* (long-tailed duck).
15. *Somateria spectabilis* (king duck).
16. *Bernicla breuta* (brent goose).

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Colonel Gordon's Expedition to the Upper Nile Regions. By *F. A. Edwards* (*Gentleman's Magazine* for August). (Macmillan and Co., 1877.)

At the time of our going to press, we have been favoured with an advance proof of an interesting paper, by Mr. F. A. Edwards, "On Col. Gordon's Expedition to the Upper Nile Regions." The paper is accompanied by a sketch Map, and gives a concise account of the exploring work so ably performed under the direction of Colonel Gordon since 1874.

Cartography.

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RECENT PUBLICATIONS OF THE INDIAN SURVEY.

PUTTING aside for the moment the evidence they give of activity and power of rapid production in the department under the direction of Colonel Thuillier, and looking at them simply from a cartographical point of view, the most noticeable feature in the last large parcel of maps received from India is that of the great variety of quality which they display. We have here a few maps which are models of excellent cartography; others at the opposite extreme, so coarsely lithographed as to be almost illegible; and many between these on each side of the average standard of the Indian Survey work, which, if it be fair to compare it with European topographical surveys and maps, is not a very high one.

The first of the new publications here is a long-expected General Map of India,[1] in two large sheets, on the scale of 64 miles to an inch, "compiled from the most recent topographical and revenue surveys, based on the Great Triangulation," distinguishing especially British territory from dependent and subordinate native states, showing railways and roads, and giving the heights in feet above the sea of many points, though no hills are indicated. The map is disappointing in its generally sketchy appearance, even in those portions of it which are reduced from detailed surveys, in the want of care which is often shown in the arrangement of the lettering, and in the absence of anything like thorough editing. In a note it is stated that—"The new orthography for the names of places in India not having been authoritatively sanctioned until after the plates of this map had been too far advanced towards completion, the old spelling was, therefore, of necessity adopted." It requires but a glance at the map, however, to see that no system of spelling, old or new, has been followed: on the contrary, we have here an elaborate representation of the utter confusion which has been created by the various systems that have been introduced to reform the Anglicised orthography of native names. For example, we have My*sore* and Tan*jor;* town names ending in *poor*, *pore*, or *pur* with the greatest impartiality; Ahmed*nuggur* on one part of the map, and Ahmed*nagar* on another; and the Pen *A.*, Vell*aur*, and Pan*ar* flowing down to the sea, side by side.

Four quarter-sheets of the Indian Atlas[3] are added,—two without hills, in preliminary form, and two in their completed state, one of these being a sheet of the year 1874, with additions to the end of last year. Laying these two finished sheets side by side, a want of harmony of design is at once apparent. In one the hill work is inexpressive, weak, and broken; in the other it is drawn in a quite different fashion, in bold, strong, conventional ridges. No doubt it is an exceedingly difficult matter to preserve a strict uniformity of style throughout the hundreds of sheets of a great work like this; but these are independent of one another in almost all respects excepting scale and size of sheet.

Two large sheets next follow, comprising a Map of the North Western Frontier, extending from the Upper Indus to Kabul,[4] made up from sheets of the Indian Atlas. Within the British frontier, and for some distance beyond it in most directions, this map is based on accurate surveys; beyond these the geography is sketched in from the compilation of various route surveys and reconnoissances towards Afghanistan. The most important line through this map, the line which it was no doubt designed to show in preference to any other feature, is that of the route into Afghanistan which leads from Attok, by Peshawur and the Khyber Pass, to Kabul. This is the official map, which would, no doubt, be issued to the army in the event of any movement becoming necessary towards Kabul. As a guide, however, it would be practically useless beyond the Indian frontier in this direction, and would, in all probability, prove to be positively misleading. It is scarcely credible that a map should be published by the Indian Survey Department in 1877 on which the geography of the route from Peshawur to Kabul is shown only as it was sketched in the route traversed by the Burnes' Mission in 1832. A series of parallel ridges, not one of which, we venture to say, is represented with any approach to accuracy, is shown running northward with great regularity from the Safed Koh to the Kabul River; there is not, however, the faintest indication on the map that there is a difference of level of more than 5000 feet between Peshawur and Kabul.

From the roughly zincographed, not very legible, and very coarse-looking maps of the Chittagong and Dacca divisions of Bengal,[5 and 6] it is a pleasure to turn to the really fine "Plan of the Sanitaria of Simla and Jutog"[12] in the Himalaya of the Punjab, surveyed and drawn by Captain George Strahan, R.E., 1872-74, a most charmingly artistic picture of the neighbourhood of these high-lying stations. This is the best piece of work that we have yet seen from India, a map of which the department may be justly proud, and which will compare advantageously with almost anything that has been done by European ordnance. Several of the new sheets of the Survey of Kumaon and British Gurhwal[13] present in an even more marked way than those of the Indian Atlas the want of consistency of design in carrying out the sheets of the same maps. Each year seems to bring a new and independent mode of execution. In sheet 20 of this map, which takes us to the very interesting region of the Nanda Devi and its dependent glaciers, feeding the source streams of the Ganges, the mountains are drawn in a manner so different from that which has been employed in sheet 7 of the same map, that the two can scarcely be recognised as parts of one design. Neither of them are good: in the former it is not easy to perceive that the dotted surfaces do really represent glaciers; there is nothing at all of the character of an ice stream in the symbol which has been adopted: it gives rather the idea of a sandy valley or dry river bed. The latter sheet is one of the worst specimens that we have seen of the one-inch scale maps, presenting a confused mass of hills, badly drawn in broken horizontal lines, in the midst of which it is not only extremely difficult to distinguish relative heights, but even to read the inscribed names of places or districts, so over laboured is the sheet with almost meaningless markings.

The new sheets of the Punjab Revenue Survey—Bhawulpoor State[15]—derive an interest from the extraordinary physical character of the barren country they represent, pitted all over with "toba" and "bhit," or "tibba" ponds and sand hills. A handsome map of the district of Ajmere,[9] in four sheets, is interesting in the same way, from the numbers of what we take to be artificial "bunds" across the streams, scattered thickly over the country, although an explanation of these, and of the dotted lines which, perhaps, mark divisions between the enclosed cultivated lands and the jungle, is deficient on the map itself.

The other maps noted beneath, which by their numbers testify to the active progress of the survey work, do not seem to call for special notice.

K. JOHNSTON.

1. India. 1877. Scale, 64 miles = 1 inch. Two sheets.
2. India. 1877. Scale, 120 miles = 1 inch. Seventh Edition.
3. Indian Atlas. Scale 4 miles = 1 inch. Quarter sheets (preliminary). 52 N.W., 34 S.W., and 23 S.W. (finished). 131 N.W. (1874), with additions to 1876: 53 N.E. (1876).
4. North West Frontier—Peshawur. Scale, 4 miles = 1 inch. Two sheets.
5. Dacca Division. Scale, 8 miles = 1 inch.
6. Chittagong Division. Scale, 8 miles = 1 inch.
7. District Balasore. Scale, 4 miles = 1 inch.
8. District Monghyr (1845-46). Scale, 4 miles = 1 inch.

9. District Ajmere. Scale, 1 mile = 1 inch. Four sheets.
10. District Mhairwara. Scale 1 mile = 1 inch. Four sheets.
11. Province of Sind (1855 to 1870). Scale, 16 miles = 1 inch.
12. Plan of Sanitaria of Simla and Jutog, Himalayan Mountains, Punjab (1872-74). Scale, 8 inches = 1 mile.
13. Kumaon and British Gurhwal. Scale, 1 inch = 1 mile. Skeleton sheets, 2, 8, 20, 22, 25, 38. Sheets, 7, 8, 9, 17, 20, 21, well shaded.
14. Lower Provinces Survey—District Sonthal Pergurmahs (1848-50). Scale, 1 mile = 1 inch. Sixteen sheets.
15. Punjab Revenue Survey—Bhawulpoor State. Scale, 1 mile = 1 inch. Sheets, 41 and 42.
16. Plan of Dera Ismail Khan. Scale, 6 inches = 1 mile.
17. Plan of Rajunpoor—Dera Ghazi Khan. Scale, 6 inches = 1 mile.
18. Plan of Gonda Khas. Scale, 8 inches = 1 mile.
19. Civil Station of Gonda. Scale, 8 inches = 1 mile.
20. Station of Nuggur Golaghaut. Scale, 8 inches = 1 mile.
21. Plan of Sehore. Scale, 6 inches = 1 mile.
22. Preliminary Charts of Beder Longitudinal Series. Scale, 4 miles = 1 inch.
23. Minor Triangulation from the Coast Series—Masulipatam to Point Divy Lighthouse. Scale, 4 miles = 1 inch.
24. Great Trigonometrical Survey of India—Levels in the North-west Provinces. Compiled from canal and railway operations. Several sheets.
25. Dehra Dun and the Siwaliks. Scale, 4 miles = 1 inch. Sheets 14, 17, 18, 26, 27, 41.

Log Book.

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Events in Peru.—The abortive attempt of Don Nicolas Pierola to disturb the peace of Peru, in the end of 1874, was described in our number for February 1875, p. 56. This year he has made a second attempt. His partisans Astete, Echenique, and the two young Carrascos seized the powerful iron clad ram 'Huascar,' at Callao, by a stratagem on May 6th, and took her down to Cobija, where Pierola came on board. On May 27th, the 'Huascar' appeared off Pisagua, which place was seized by the insurgents. Meanwhile the squadron, which remained loyal to the Constitutional President, General Don Mariano Ignacio Prado, left Callao on the 12th, steamed into the anchorage of Pisagua, and opened fire on the 'Huascar.' The squadron consisted of the iron clad frigate 'Independencia,' the corvette 'Union,' and gun boat 'Pilcomayo.' The iron clad ram 'Atahualpa' remained at Iquique. The 'Independencia' carries fourteen 70-pounders, and two 150-pounders. The 'Huascar,' a turreted ram, has two 300-pounders in her turret, and two 40-pounders. The fight continued for about two hours, and when darkness came on the 'Huascar' decamped, steaming north. On the 29th she encountered H.M.S. 'Shah,' bearing the flag of Admiral de Horsey, and H.M.S. 'Amethyst,' off Ylo. A summons to the 'Huascar' to surrender, on the ground that she had committed illegal acts on British vessels, was refused. The 'Shah' then opened fire, which was returned, and a very interesting action ensued. The English officers speak in high terms of the way in which the two brothers Carrasco fought and manœuvred the 'Huascar.' At dusk the 'Huascar' got out of action, ran down to Iquique, and surrendered to the 'Independencia' on the 31st of May. Thus Pierola was made prisoner.

On the 1st of June the Peruvian Ministry, consisting of Dr. La Rosa, Señor Garcia y Garcia, Don José Aranibar, General Manuel de la Cotera, and General Buendia, resigned. A new ministry was formed on the 6th under the presidency of General Buendia, with General Bustamante as Minister of War, Dr. José Felix Garcia of Finance, Dr. Morales of Justice, and Don Cirilo Rospigliosi of Foreign Affairs. The latter will probably have to conduct the negotiations consequent on the somewhat irregular action between the 'Shah' and the 'Huascar.' Señor Rospigliosi is the son of Dr. Don José Julio Rospigliosi, of Tacna, one of the most upright and learned judges that Peru has produced. The son is an able and accomplished lawyer, with no mean powers as a poet. His poem on the death of his father, in 1857, is a work of considerable merit.

Heights in the Bolivian Andes. — Mr. Minchin, the civil engineer who has been doing such useful geographical work in Bolivia, forwards the following heights, which he considers to be reliable, as resulting from his levelling for the railways between La Paz and Lake Titicaca. He is confident that the height of Illimani is within 10 feet of that given, and all are interesting, because former results depended on barometrical instruments.

Lake Titicaca	12,545	feet	above the sea.
Alto de La Paz.....	13,389	,,	,,
Plaza Mayor, La Paz	11,946	,,	,,
Peak of Illimani	21,224	,,	,,

Pentland's height of Lake Titicaca was 12,795 feet, of Illimani 24,200, and of the Sorata (Illampu) 25,250. (See his paper *R. G. S. Journal*, v., p. 77 and 78, and p. 81.) But Mrs. Somerville gives Pentland's height of Illimani at 21,150 and of Sorata at 21,290 (*Physical Geography*, i., p. 158, *n.*), and Humboldt says that Pentland gave him the height of Illimani 21,145, and of Sorata 21,286.

FitzRoy made the Peak of Aconcagua, in Chile, 23,200 feet above the sea, increased afterwards to 23,910. But M. Pissis brings it down again to 22,296 feet. Humboldt's height of Chimborazo is 21,422 feet. After all, Aconcagua appears to be the highest peak of the Andes.

Russian Wintering Station in Novaya Zemlya.—During the last few years a marked decrease has taken place in the number of Russian vessels visiting Novaya Zemlya for fishing and hunting purposes, while the Norwegian vessels have every year become more numerous. In 1835 the number of Russian vessels amounted to 137, while in 1875 it had dwindled down to 5. The chief difficulty the Russians have to contend with is that the ports in the White Sea, from its secluded and land-locked character, become open to navigation later, and get frozen up sooner in the season than those on the Murmanian coast and the shores of Novaya Zemlya, which are exposed to the influence of the Gulf Stream. The spring and autumn, moreover, are the very times when hunting and fishing is most easily carried on. As the Russians thus generally find themselves three months behind their Norwegian brethren in the field, the Russian society for saving life has determined to form a special commission at Arkhangel, with the object of providing the Russians with the means of wintering with some degree of comfort, and with a sort of place of refuge in case of accident. The station house has been already built at Arkhangel, and

will be conveyed by ship to Novaya Zemlya in the course of the summer, for erection close to the Malikarmakuli anchorage, in Moller Bay. The station consists of a two-roomed house, a bath room, a boat house, and a sort of observatory. The house rests on stone supports, has double walls, double flooring, and double ceiling. Each room is furnished with two good stoves, to burn wood; the windows are thickly glazed, and barred with iron. The bath room is at a distance from the house, and is fashioned so as to serve as a dwelling house in case of fire occurring to the main building. Six Samoyede families will be conveyed to Novaya Zemlya this summer, with the necessary provisions, &c., to take care of the station. Experience of late years has proved that with careful observance of all necessary precautions, no danger is to be apprehended from wintering in Novaya Zemlya, desolate though the place be.

Colonel Prejevalsky.—The latest news of this traveller dates the 6th June, from a place called Olneus (?). His communication to the Imperial Russian Geographical Society is as follows:—"I have journeyed 200 versts east of Lob Nor. All the scientific labours have been crowned with success. I have captured three wild camels. All in good health. Will send you detailed account from Kuldja." In a letter, written from the Yoldus River, to the Govenor-General of Turkistan (probably about the same date), Colonel Prejevalsky states that the Chinese troops had, in April last, taken possession of the fortified pass of Devan, in the Tian-Shan, and of the Kashgarian towns of Toksun and Turfan.

Marseilles Geographical Society.—A new Geographical Society was inaugurated at Marseilles on the 6th of March last. A library and monthly *Bulletin* have been started, as well as a popular course of geographical instruction, to which the municipality and Chamber of Commerce have contributed subventions. A classified museum of geographical products will be organised in connection with the same, and ethnological and maritime sections will be added, if possible. Contributions to the amount of 20,500 have been received, and 295 members have already joined, a number which it is expected will largely increase. The President of the Society is M. Alfred Rabaut, ship owner, who for years has had an extensive connection with Zanzibar and Madagascar. M. de Lesseps is honorary President.

Volcanic Region in Eastern Persia.—Major Beresford Lovett was the first to point out, in 1871, the existence of an active volcano in the Sarhad Mountains, an unexplored tract north of Bampur, extending to the Afghan frontier. In this region there is an extinct volcano called Kuh-i-Basman, 10,000 feet above the sea, another 12,000 feet above the sea, called Kuh-i-Naushada; and Major Lovett received intelligence of an active volcano further to the north-east, and nearly south of Sistan, called Kuh Taftan. Colonel Macgregor and Captain Lockwood have recently made a journey through Khuzistan and Baluchistan to India, and Captain Lockwood distinctly saw the Kuh Taftan from a distance of about 40 miles. It is now covered with snow, and is in an active state.

This volcanic region of Sarhad is still unexplored, and is described as a lofty plateau above the region of palms, inhabited by nomadic tribes. The nearest approach to Sarhad from the north-west was made by Sir Frederic Goldsmid and Majors Beresford Lovett and Euan Smith in their journey from Bam to the Helmund in 1871. The nearest approach from the north-east was Christie's journey to the Helmund Valley. To the south the nearest approach was made by Pottinger in his journey from Nushki to Bampur. It would be a most interesting undertaking to explore the Sarhad plateau. The traveller might start from Jashak and proceed by way of Angaran, in Bashkurd, and Bampur; and, if succesful, he would bring back most valuable geographical results. At the same time he might aim at tracing the still unknown course of the Bampur River.

Tea Trade in Bokhara.—Colonel Maief, during his recent journey in Bokhara, made some investigations into the question of the tea trade, and arrived at the conclusion that Russia could undertake to supply Bokhara with tea brought from Han-chow-fu, in China, by way of Guchen, Kuldja, Tashkent, Samarcand, and Katty-Kurgan, at a profit of about 37 per cent. on the present price of 50 roubles a *pud*, which is the minimum price of green tea in Bokhara.

Survey of the River Indus Mouth.—Lieutenant A. W. Stiffe, late I.N., surveyed the Indus banks in 1867, and, as extensive changes were known to have since taken place, he was deputed to re-examine the mouth of the river in March last. Lieut. Stiffe found that the Hajamro beacon had been moved (without any official notice being given thereof) about a mile and a half from its old site. He very properly animadverts on a practice so dangerous to navigation. An enormous extension of the banks off the Hajamro mouth was proved, amounting to 3½ miles seawards, and in some places encroaching on the old ten fathoms contour. The Hajamro, which in 1867 was the fresh-water mouth, and the only navigable one, is now nearly closed, and the great body of fresh water enters the sea at the Jua or Sisa mouth, whither the pilots have all removed, nearly 10 miles northward of its former position. This great change has, according to the pilots, only taken place since last monsoon. The existing chart is not very correct, the large channel marked "River Indus" having no existence. The river, in fact, is so erratic, and such vast quantities of solid matter are brought down in suspension, that no chart can be depended on for long.

Lieut. Stiffe's survey was plotted on the scale of 10,000 feet to one inch; the soundings were reduced to low water springs, Karachi datum, by a comparison of soundings alongside with the Karachi tide tables. A few soundings have been taken between Karachi and the river, but these do not testify to any great change, so that a re-survey does not seem urgent.

None of the "Pilots" or "Sailing Directions" give any particulars about the trade of the river, the following is therefore added by Lieut. Stiffe. The port of the river is Keti (mis-spelt Kellee on our charts), which stands on the left bank of the Hajamro, 10 miles from the present mouth, and has a population of about 2000. All sea-going vessels enter and clear from this place, to which point cargoes are brought down by flat-bottomed river boats, and then transhipped. The trade is chiefly grain. The navigating season is from the end of August to the end

of May, the port being closed during the monsoon months. The total present sea-going trade is about 2400 vessels per season, amounting to 78,000 tons; the largest boats being a little over 100 tons, with a draught not exceeding 9—10 feet.

African Exploration Fund.—The Council of the Royal Geographical Society has taken steps to organise means for the systematic and continuous exploration of Africa; desiring at the same time that the proposed work should be in harmony with the efforts of the King of the Belgians in the same direction. The Council has assisted in establishing an "African Exploration Fund," to be appropriated to the scientific examination of Africa in a systematic and organised manner. To secure the appropriation of the Fund to the special objects for which it is raised, the Council has named a Special Executive Committee out of their body, with the President of the Society for the time being as Chairman. This Committee has invited support and co-operation from the public, and a meeting was held at the Mansion House on the 19th of July, the Right Hon. the Lord Mayor in the chair. The Council has headed the list of subscriptions with the sum of 500*l*.

The Special Committee has issued a circular announcing the objects of the Fund, and giving a list of routes in Eastern Africa that have been suggested for exploration. The circular is accompanied by a sketch map, designed to show how large a portion of Africa has been first explored by British travellers.

New Nubian Railway.—Dr. Schweinfurth has communicated to the *Exploration* some particulars respecting the construction of the Nubian Railway from Wadi-Halfa to El Ordeh in Dongola, the total length of which is to be 355 kilometres, one-tenth part being already completed. Below Wadi-Halfa the Nile is navigable to its mouth, and it is not at present proposed to connect Wadi-Halfa with Siut, the terminus of the Egyptian system. The Nile is navigable between El Ordeh, the terminus of the new railway, and Dobbeh, which is the starting point of caravans for Khartum and for Darfur; the new railway will thus prove of future importance in conveying the produce of Darfur and even Wadai to the Mediterranean, the latter having hitherto principally found its way thither by way of Bornu and Tripoli.

Portuguese African Expedition.—The two African explorers, Major Serpa Pinto and Captain Brito Capello, who had gone to Paris and London to obtain the necessary equipment for the geographical expedition to Central Africa, have already returned to Lisbon, and will start for Loando in the 'Zaire.' Major Serpa Pinto has had great experience in African exploration, having already made extensive journeys to Lake Nyassa, and to near the Victoria Cataracts of the Zambesi. M. A. De Abbadie, of Paris, has presented the explorers with a remarkable universal theodolite, made by Eighens, with an inverse action of his own invention, which he has called the "Abbas," and with which he determined the geodetical elevation of Abyssinia during the eleven years he spent in the exploration of that country; they also take a new apparatus, invented by Perry, of London, for the study of terrestrial magnetism; and among the sextants which they take there is one which is a perfect bijou: it is very minute and made of copper and platinum, by Laurien, and marks thirty seconds.

Correspondence.

—:o:—

QUERIES TOUCHING THE SCURVY REPORT.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

SIR,—*In re* Arctic scurvy. Your valuable periodical, and the various pamphlets published on this subject, have materially modified many of my views. Can you kindly oblige me by answering a few queries?

Sir G. Nares is censured for not obeying the now well-known paragraph No. 11 of the Medical Director-General's memorandum. Paragraph 2 of this memorandum lays great stress on the men having 2 lbs. of meat daily to prevent "impairment of physical power," &c. The men did not have it. Query 1. Why does Sir G. Nares escape censure on this head? from its position and the stress laid on it, I should have thought it much more important than curt paragraph 11. It is true, Sir G. Nares says the men could not or would not eat 2 lbs. of meat daily. But he also says lime-juice could not be taken. His evidence is of no more value on one count than on the other. Query 2. If it is correct that the men would not eat it, as an old naval officer you can tell me if the crew could not be punished for presuming to think they had had enough to eat, when the Medical Director-General told them they had not? perhaps it is considered their suffering from scurvy is sufficient atonement, and justice is tempered with mercy. Query 3. Is there no later precedent for sudden outbreaks of scurvy than Anson's voyage, 1740, quoted page xiii. *Medical Report*. Page xxv. *Medical Report*, beef tea is strongly recommended as part of the sledge diet, "not only as a refreshing and invigorating, but also as an *anti-scorbutic article of diet*." Query 4. Why was not this sent with the Expedition, as I presume it was as well known in 1875 as in 1877? Query 5. Why was not the pemmican made with lime-juice, as *now* suggested by the Medical Director-General? There are other suggestions on diet made by eminent medical men *now*? Why were they not made when they might have been useful? Query 6. Can you tell me if Admiral Richards, Mr. G. Murray, and Mr. Bayley, who did not take lime-juice are still alive? Science says they ought not to be. Science also says the former sledge journeys could not have been performed on the same diet as that of the parties of 'Alert' and 'Discovery,' and that facts have been kept back. Query 7. What are the suppressed facts? It is true Dr. Guy (5411) says he prefers "vulgar experience" to "any scientific data whatever," because reliance on the latter has frequently misled him. I have many other queries I should like to have solved; but cannot trespass further on your valuable space, so must submit myself,

Yours, truly,

PUZZLED.

—:o:—

THE UZES, TORKS, OR MAGYARS.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

SIR,—By your favour I have now examined three out of the four kinds of Turkish nomades, who lived in the Russian steppes in the days before the great Mongol invasion, namely, the Comans or Poloutsi, the Pechenegs, and the Berendeens. We still have left for consideration the fourth class, the most difficult, perhaps, and certainly the most interesting of the whole in our present inquiry. My view in regard to them is not the orthodox one. In fact, so heretical is it that I am somewhat diffident about propounding it. I will reserve my heresy, however, for the end of my letter. This class is designated specifically by Nestor, in his enumeration of the four branches of the nomades, as "*the Torks*" (*op. cit., ed.* Paris i., 253, 254). The chronicle which goes under the name of Nikon calls them *Tortozy*.

The name Tortozy I take to be a palpable corruption for Tork ozy, that is, the Uz Torks. This is very interesting, for the Byzantines, as we shall show presently, have several references to the Uz Turks, and Karamzin, from apparently quite a different reasoning, arrived also at the conclusion that "*the Torks*" of Nestor were the same people as those called Uzes by the Byzantines. "Les Uzes qui sont, sans doute, ceux que nos annales designent sous le nom de Torques" are his words in the French translation (ii., 86). Inquirers have generally confused these Uzes with Ghoz of the Arabs, and I have done so myself in a former paper, published in the *Journal of the Ethnological Society;* but it is quite clear to me, now, that this is a mistake; and that the mistake introduces much confusion into Turkish ethnology. The Uzes apparently gave their name to the Dnieper, whose Turkish name was Usu. Thus Von Hammer writes: "Den Dniepr, oder wie ihn die Tataren nennen, das wasser von Usu (Ocsakof) oder den fluss der Usen" (*Geschichte des Osman. Reich* iii., 421); and, long ago, Anna Comnena, speaking of the estuary of the Dnieper, tells us it was called Ozolimna, and was so named (she says) from the Hunnic race, who lived around it; for, she says, those whom we call Hunnic are commonly called Uzes, whence, she says, the place was probably originally called Uzolimna, and afterwards Ozolimna (*Stritter* ii., 947). Having analysed their name, we will now turn to their history, and quote all the passages in which their name occurs.

We read in the narrative of Constantine Porphyrogenitus that about fifty years before he wrote (*i.e.*, 894-899) the Uzi, in conjunction with Khazars, attacked the Pechenegs and expelled them from their country, which the Uzi afterwards occupied until his (Constantine's) own day. He adds, further, that some of the Pechenegs remained behind, and continued to live with the Uzi (*Stritter* ii., 938 and 939).

We do not meet with any mention of them, so far as I know, for almost a century, when in the year 985 we read in Nestor, "Vladimir, with his uncle Dobrinia, made an attack by water on the Bulgarians (*i.e.*, the Bulgarians of the Danube). He was supported by the cavalry of the Torks, which followed him along the shore (*op. cit., ed.* Paris i., 122).

We have to make another great leap before we again hear of them, which is in the years 1049 and 1050, when we read in Cedrenus that the Pechenegs and Uzes were often at feud with one another (*Stritter* ii., 940).

In the year 1054 Nestor tells us that Vsevolod, Prince of Pereislavl, had a war with the Torks, whom he defeated, whereupon Bliush, the Prince of the Poloutsi, wished to revenge them and attack him, but he arranged matters with them (*op. cit.*, i., 200).

In 1060 Isiaslaf, Prince of Kief, with the Princes Sviatoslaf and Vseslaf, combined together and marched at the head of a great armament against the Torks, who were panic-stricken and abandoned their country, and many of them perished in their flight, from cold, hunger, and disease. "All," says the old chroniclers, "were struck with the Divine wrath, and Russia" (*i.e.*, the principality of Kief) "was rid of these idolators" (*Nestor* i., 201).

I cannot avoid the conclusion that the retreat of the Torks mentioned by Nestor was a part of the same story told us by the Byzantine Scylitzes under the year 1061. We are told that about that year the nation of the Uzes (who were a nobler race than the Pechenegs and the Scyths, *i.e.*, probably, in this place, the Hungarians) crossed the Danube with all their people and baggage upon long boats and pinnaces made from hollowed trunks and upon inflated skins. The Roman and Bulgarian guards opposed their passage, but were defeated; and their commanders, Basilius Apocapes, and Necephorus Botaniates, were made captive. The Uzes, we are told, in one account, numbered 60,000, in another 600,000, and they overran the low country on the Danube; a section of them advanced as far as Thessalonica, plundering and devastating. But the winter proved very severe, and the greater part of them perished, only a few returning to their main camp (*Stritter*, 941).

Constantine Ducas, who was somewhat famous for his avarice; was then Emperor of Byzantium. Although aware of the strength of the invaders, he grudged, according to some, an adequate outlay upon troops to oppose them, while others thought it was because he was afraid of their strength that he delayed action and sent envoys with gifts to their chiefs to treat. They apparently accepted his gifts, but continued their devastations in Thrace and Macedonia. The feeble Emperor collected a body of 150 men, with which he marched to a place called Choerob. News, however, soon after reached him that the greater part of the invaders had been decimated by the plague, and afterwards by the Bulgarians and Pechenegs; that the two frontier commanders who had been made prisoners had been released; and that the commander of the Uzes had retired beyond the Danube. After this disaster some of the Uzes submitted to the Emperor, and were granted settlements from the public lands in Macedonia (*Stritter, op. cit.*, 941-944). This expedition was, no doubt, as I have said, the complement of the migration from the banks of the Dnieper, mentioned by Nestor, and it was no doubt a fatal event in the history of the Uzes or Torks. Those who remained behind in Russia were only an unimportant section, and were more or less in the service of the Russian princes. It was two years after this that the Comans first appear in Russian history, and thenceforth occupied the role previously filled by the Torks and Pechenegs. The Uzes, who were settled in Macedonia, were similarly in the service of the Byzantine Empire. They are, in fact, qualified as "the Scythic mercenaries, that is, the Uzes," and "the mercenary Uzes." These notices occur during the reign of Romanus Diogenes, and a section of them, under a leader named Tame, is mentioned as having proved faithless to the Romans (*id.*, 944 and 945). They are again mentioned as auxiliaries in the Roman army in its struggle with the Pechenegs in the reign of Alexius I. Comnenus (1081-1118) (*Stritter*, 946.)

Let us now return once more to Russia. As I have said, the great migration of the Torks thence took place in 1060. It is curious that a year later the Poloutsi or Comans made their great attack on the principality of Kief—perhaps it was in revenge for the Russian campaign against the Torks. All of the latter did not migrate, a few remained behind; and we next read of them in the Russian chronicles in the year 1080, when we are told that, after making an attack on Pereislavl, they made an incursion into Russia (*Nestor* i., 226). Their chief town was Tortchesk, an appanage apparently of the principality of Kief, which was burnt by the Poloutsi in 1093 (*Nestor* i., 240). They afterwards laid siege to it. It is, doubtless, represented by Otchakof, near Pereislavl, on the Dnieper. It was bravely defended by its garrison of Torks; the besiegers determined to divert the river so as to starve out the garrison. The Torks appealed to Sviatopoik for supplies, which he sent; but they could not penetrate into the city, which was at last forced to open its gates. The town was terribly ravaged, and many of its inhabitants migrated (*ib.*, 243-245). About the year 1075 we find Torks mentioned as in the service of Vladimir, Prince of Chernigof (*ib.*, 247.) In the year 1097 we find a Tork, who is called a Tork Berendi, employed by the people of Sviatopolk to blind his rival Vassilko (*ib.*, 265). In the great defeat sustained by the Poloutsi at the hands of the Russians in the year 1103, we are told that the latter captured some Pechenegs and Torks in their camp (*id.*, 285).

In 1120, we are told the Torks and Berendeens abandoned Russia, and, after wandering hither and thither for some time, were entirely dispersed (*ib.* ii., 4).

In 1125, "the odious Turks" were in alliance with the Poloutsi against the Russians, but were driven by Yaropolk to take refuge in their town, *i.e.*, Tortchesk (*id.* ii., 10).

Two years later, a body of Torks is found in the force which the Grand Prince Mitislaf sent against the Krivitches (*id.* ii., 13).

About the year 1151, we read that the Berendeens, with rough kibitkas, and the Torks, with black coats, who were apparently in the service of Isiaslaf, assisted the latter to recover Kief, and, we are told, committed great ravages (*id.* ii., 70).

A year later, we read of Isiaslaf sending his son, Mitislaf, against the Poloutsi, at the head of a body of Berendeens, Torks, and Pechenegs (*id.* ii., 76).

The Torks are again mentioned in the service of Isiaslaf in 1154 (*id.* ii., 84).

In 1202, we read that the Black Coats (the Berendeens and Torks, *sic.*) assisted the Prince of Gallicia in an attack on Kief (*id.* ii., 175). This is the last mention I can find of the Torks in the Russian annals, and it would seem that they had become insignificant, and were then Russian subjects.

Having thus brought together the various notices of the Uzes or Torks, the question which remains is to inquire into their origin. The name Uzes, as I have said, is of small value for this purpose. The name Tork is more fruitful. It is very strange to our ears to find the name Tork or Turk used not generically (including all the various sections of the race, known to us, in consequence, as the Turk race), but specifically, as the name of a special tribe of the Turk race; and yet there can be no doubt that, as, in the case of the Mongols and other nomades, what was once the name merely of a tribe was extended when that tribe became famous to the whole race. It was certainly so with the Turks, and among the Chinese the name Tu kiu, which is their equivalent for Turk, was used specifically, there can be no doubt that, in early times, it was similarly used in the west by the Russian, Byzantine, and Arab writers. The name Tork, as used by Nestor, is certainly specific, and contrasted with Pecheneg, Berendeen, etc., etc., other tribes of the same race. This assists us very much in our present inquiry.

When we first meet with the Uzes they were, as I have shown, in close alliance with the Khazars, and at issue with the Pechenegs. Now, on turning to the account of the first invasion of the Pechenegs, as recited for us by Constantine Porphyrogenitus, we find him saying that "the race of the Turks lived formerly near Khazaria, in a place called Lebedias . . . . through which flowed the river Khidmas, also called the Khingylus, and he tells us they were then called Sabartoasphali. They formed seven tribes, and had among them no king, either native or foreign, but certain Boebodi, of whom the first was called Lebedias. They lived for three years in close alliance with the Khazars, whose king gave their chief, Lebedias, a noble Khazar for a wife. . . . . The Pechenegs, having been defeated by the Khazars, deserted their country, and occupied that of the Torks; but a war having broken out between the Torks and the Pechenegs, the former were defeated and split into two sections, one of which was driven towards Persia and still retained the name of Sabartoasphali, the other section was driven westwards, under Lebedias, and found refuge in the district called Atelcusu" (*Stritter* ii., 609). I have no doubt myself that the Torks of Constantine Porphyrogenitus and the Torks of the Russian writers were the same people, and were the same also as the Uzes. The continuity between them is perfect. The common use of the name Turk, which was then used specifically, the common alliance with the Khazars, the common antagonism of each to the Pechenegs, and their occupation of the same area, are sufficient to show this; and yet how comes it that the identity has never, so far as I am aware, been before suggested. The reason, I take it, is that it involves a good deal more than appears on the surface. It involves, in fact, a reconstruction of our ethnographic notions—one also in which I must humbly take a part, for I have published very different views in former times. It involves, in fact, no less a notion than the making of the Magyars of Hungary Turks, for there can be no doubt that the Turks of Constantine Porphyrogenitus were the Magyars of Hungarian history. Were the Magyars, then, a Turkish race? I now believe so most implicitly. This does not mean, of course, that the Hungarians are all of Turkish race. Their language and antecedents are mainly Ugrian and not Turkish; but it means that the race of conquerors who invaded Hungary in the end of the ninth century, and who gave the inhabitants of Hungary a new name, namely, that of Magyar, were Turks and not Ugrians. It means that we must separate the Hungarians proper from the Magyars, just as we separate the Hungarians from the Turkish Comans, who so largely occupied Hungary in the thirteenth century, and whose language and other idiosyncrasies have also disappeared and been swallowed up by the Ugrian element of the population. My view is, then, that the Magyars were, on a larger scale, what the Comans were on a smaller, namely, a tribe of Turks who conquered a population of Ugrians. These Ugrians, I take it, were the descendants of the Huns and Avares, who so largely settled in Pannonia.

It has been the fashion of late years to ignore the descendants of these great races as if they had become extinct when Arpad and his Magyars entered the country, but such a view is entirely erroneous. The wars of Charlemagne against the Avares were no doubt savage wars, and destroyed many of them, but they were neither so savage nor so prolonged as his wars against the Saxons; and we know very well that he was far from extirpating that independent race. Nor is it at all likely that he should have performed this feat in regard to the Avares. We know, as a fact, that he did not do so; and although the notices of Pannonia between the time of his death and the invasion of the Magyars are scanty, they are sufficient to prove this; thus, we read under the year 822, in the life of Louis the Pious, that in that year the Avares sent an embassy to the Emperor (*Vita Hludoviici Pertz* ii., 617; *Eginhardt's Annals, id.* i., 209); while we read in the *Annales Fuvavenses* under the year 873:—"Hunni Romanos et Gothos atque Gepidos de inferiori Pannonia expulerunt et illam possederunt regionem, quoad usque Franci et Bagoarii cum Quarantanis continuis affligendo bellis superaverunt eos autem qui obediebant fidei et baptismum sunt consecuti, tributarios fecerunt regum, *et terram, quam possident residui, adhuc pro tributo retinent regis usque in hodierum diem*" (*Zeuss*, 741). Again, not only do the traditions about Attila still survive among the Hungarians, as has been so well shown by Thierry, but the Seklers of Transylvania—very Hungarians of the Hungarians—are especially named by the Notary of King Bela under the name of Siculi, and he tells us they were descended from the followers of Attila (*Zeuss*, 756). Other evidence might easily be adduced, but this will suffice to show that both Huns and Avares were largely represented in Hungary when the Magyars invaded it and to support my contention that the Ugrian element among the Hungarians is derived from them.

Let us now turn to the direct evidence for making the Magyars Turks. Rubruquis, as is well known, deduced the Hungarians whom he knew from Pascatir, *i.e.*, Bashkirland. Now the Bashkirs are very typical Turks. Not only so, but, as the Baron D'Ohsson long ago showed, the names Bashkir and Magyar were equivalent terms among the early Arabs. Thus, Maçudi calls the Magyars Bashkards. Ibn Haukal says—"There are two Bashkard nations, one in the extreme west (it ought to be east) beyond the Bulgarians, to whom they are subject. *The other, more numerous, lives near the*

Pechenegs. Like the latter they are Turks, and live near the Roman Empire (*Voyage of Abul Cassim*, 257). The geographers Yakut and Kazvii similarly speak of the Magyars as Bashkirs. A considerable extract from the former has been translated by M. Renaud (*Abulfeda*, ii., 294), which is very curious, inasmuch as it speaks of a colony of Bashkirs as settled *among the people called Hungarians*. Ibn Said is quoted by Abulfeda as making a similar assertion (*id.* ii., 312), and also as describing the advance of the Tartars against Sebenico, and of their having been defeated there by a combined army of Hungarians, Bashkirs, and Germans (*id.*, and Yules' *Marco Polo*, 2nd ed., ii., 493, note). Ibn Said in another place very distinctly identifies the Bashkirs, whom he calls Turks, with the Magyars (*Abulfeda*, 294). Juveni, in describing the Tartar invasion, uses the name Bashkir for the Hungarians, and in a note to the passage (*Histoire des Mongols*, ii., 620) D'Ohsson adds that among the Turks *b* and *m* are letters so generally confounded that the names Bashkir and Magyar are, in form, almost the same. Rashid uses the name Bashkirs in the same way as Juveni (*id.* ii., 621). Khondemir does so also (*Journ. Anal*, 4th series, xvii., 110). In remarkable confirmation of the arguments here used we find Abulfeda describing the country of the Bashkirs proper as the land of the Majars, situated in the north of the seventh climate. He calls them a Turkish race, living, according to some authors, between the Pechenegs and the Sekek, in the land of the Bulgarians (*id.* ii., 324).

These various passages make it clear that the Magyars were, in fact, merely a branch of the Turkish Bashkirs. On turning, again, to the account of Constantine Porphyrogenitus, we find him describing the Turks as being divided into two sections, one of which retired towards Persia—that is, retired towards the Caucasus. Now, we find that on the banks of the Kuma there are still ruins of a famous mediæval town and mint of the Golden Horde called Majar or Kumajar. Many writers have viewed in this town a distinct trace of the occupation of the Magyars. Klaproth argued on the other side, on the ground that the name had a *Turkish* etymology, and the remains were of Turkish character. This exactly agrees with our contention, and makes it exceedingly probable that the town of Majar does, in fact, represent the division of the Turks which retired towards Persia. I may mention that Von Hammer names a castle of Majari in Irak Arab, which he connects with the same migration (*Golden Horde*, 290); so that a section of the race probably got as far as Persia proper.

There are some broken tribes of Turks in the Caucasus, whose traditions further illustrate our subject. These are the Basians and Karatshi. Of the former, Klaproth says:—"Their elders report that they were long ago settled on the steppe of the Kuma as far as the Don, but at what particular time they are unable to state. Their capital, which is said to have been very magnificent, was named Kirk Majar, which in their language means the forty stone buildings, or the forty four-wheeled waggons, according to the twofold interpretation that may be given to Majar. They assert that the ruins of Majar which yet subsist are the remains of this city. Here lived several of their princes, who at the commencement of the Hegira lived at constant enmity with their neighbours, and were at length expelled by them, on which they retired to the great Kabardah, whence they were in the sequel driven by the Circassians" (Klaproth, *Caucasus*, 281). In regard to the Karatshai (? Kara Uzes or Black Uzes), he says:—"They assert that they removed from Majar to the district they at present inhabit before the Circassians came to the Kabardah" (*id.* 284).

It is further remarkable, as part of the same contention, that, as Colonel Yule has pointed out, a tribe Majar is associated by Shereffeddin and in the Masalah al Absaa, in the one case with the Alans, and in the others with Circassians, Russians, and As or Alans, that is, with the country of the Caucasus (*Marco Polo*, 2nd ed., ii., 492).

Now, the Emperor Constantine tells us the section of the Turks which retired towards Persia was called Sabarto Asphali. Zeuss explains the first half of the name as black, connecting it with the Teutonic *swart* or *Schwarz*. Kara Atshi means Black Atshi, so that the names Kara Atshi and Sabarto Asphali are to some extent connected. The former of these names is apparently a form or corruption of Black Uzes.

Thus, whichever way we test our problem, we arrive at one conclusion, namely, in making the Magyars a race of Turks, now represented most purely by the Bashkirs and the Turks of the Caucasus. There seems to me to be only one argument on the other side, and that is the fact of the names of the Magyar chiefs having been of other than Turkish origin, but this is only a superficial difficulty.

The names, so far as we can judge, were of the same class as those of the Bulgarian leaders, and the Bulgarians and Khazars, as we know, were either identical or closely related tribes. Now we know also that from the seventh to the tenth century the Khazars were dominant in all the steppes of Southern Russia, and that it was from them the chief culture of that region was derived. We know the close connection there was between the Turks of Constantine and the Khazars, and how several tribes of the latter went over and joined the former. If we knew more of their history, I have no doubt that we should find that their chiefs, who were not kings, but are described by the Emperor-author under the Slavic title of Boebodi, or Voivodes were supplied to them by the Khazars. It was probably from the Khazars that the Hungarians derived their costume and many of their customs, and it is by no means impossible that the Hungarian huzzars derived their name from the Khazars. So that I look upon the Magyars as a race of Turks, governed by Khazar princes, and more or less their dependents.

This view is, I believe, new; and I believe it clears up and renders plain one of the most perverse riddles in the ethnography of Eastern Europe. I should feel very grateful for any criticism or new light on a question which is of prime interest to all who wish to unravel the tangled web of early European ethnography.

Yours, &c.,

DERBY HOUSE, ECCLES. HENRY H. HOWORTH.

Proceedings of Geographical Societies.

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ROYAL GEOGRAPHICAL SOCIETY.

Meeting of 25th June, 1877.

Sir RUTHERFORD ALCOCK, President, in the chair.

Mr. A. R. WALLACE delivered a lecture (the third of the Session) on

THE COMPARATIVE ANTIQUITY OF CONTINENTS, AS INDICATED BY THE DISTRIBUTION OF LIVING AND EXTINCT ANIMALS.

The Lecturer commenced by observing that much of the interest attaching to geography was centred in the general distribution and the peculiarities of animal and vegetable life in different countries. Each continent, each island, and, generally, every tract of land, marked out by natural boundaries, is distinguished by a more or less peculiar flora. It was soon ascertained that some of the facts of distribution were due to diversities of climate, altitude, and geological structure; others were accounted for by barriers to the migration of organisms, such as oceans, seas, mountains, deserts, &c. The discoveries of Lyall and Darwin, who elucidated

the gradual and never-ceasing changes—(firstly) in the physical conditions and mutual relations of the land surfaces of the globe, and (secondly) in the forms and structures of all organisms, added most materially to our knowledge of this subject.

Having tested the application of truths in a variety of critical cases in his recent work, Mr. Wallace considered himself justified in applying the same rule inversely, and making these facts of distribution yield information as to the changes in geography which have produced them. One great peculiarity of the distribution of land lies in its freedom from complete isolation. It is possible, the lecturer remarked, to travel from the extreme north of Asia to Cape Horn, Cape of Good Hope and Tasmania, without ever going out of sight of land. The continents, indeed, resembling as they do a huge creeping plant, with roots, at the North Pole, and the matted stems and branches of which cover a large part of the northern hemisphere and send three great offshoots toward the South Pole, offer great facilities for the transmission of varied forms of animal life. There is evidence to prove that during the greater part of the Tertiary period the relative positions of our continents and oceans did not greatly differ from their present forms, and the former, back to the ime of the Devonian formation, were never so completely submerged as to be replaced by oceans comparable in depth with our Atlantic or Pacific.

The Lecturer then proceeded to sketch out the zoological features of the six great biological regions. These are as follows: the Palæarctic or North Temperate region of the Old World, the most extensive and probably most ancient of all. It includes the whole of Europe, by far the largest part of Asia and a considerable tract of North Africa. It is characterised by a considerable number of typical groups, although in recent geological times it has lost much of its ancient richness and variety of animal life. The Ethiopian region, consisting of Africa south of the Tropic of Cancer with Madagascar, is of comparatively small area, but its tropical character has endowed it with a greater richness of large animals than any other part of the globe of equal extent. The Oriental region comprises all tropical Asia east of the Indus, with the Malay Islands as far as Java, Borneo, and the Philippines. Its present area is smaller than any other except the Australian, but it was doubtless at no distant epoch connected with Indo-China, and was then not much smaller than the Ethiopian region. There is a great variety of birds and insects here, though the mammalia are few in number.

Going back to the Miocene Age, we find that the deposits which occur in France, Hungary, Greece, North-western and Central India, in Burma and China agree generally, and point to the fact of this great continent having been then as now one continuous land.

The early Tertiary deposits over the Sahara, and parts of Arabia, Persia, and Northern India, point to the fact that a sea or strait extended from the Bay of Bengal to the Atlantic Ocean, thus cutting off the Peninsula of India, with Ceylon, as well as all tropical and South Africa, from the great northern continent. There is, therefore, good evidence that the great Euro-Asiatic continent of Miocene times exhibited in its fauna a combination of all the main features which now characterise the Palæarctic, Oriental, and Ethiopian regions; while tropical Africa and the Peninsula of India, possessed a much more limited fauna, consisting mainly of animals of a lower type, and more characteristic of Eocene or Secondary times. If this view be correct, the great mammalia, now so specially characteristic of Africa, are all comparatively recent immigrants, who took possession of the country as soon as an elevation of the old Eocene and Miocene sea-bed afforded a passage from the southern borders of the Palæarctic region. This event probably occurred about the middle of the Miocene period.

Our knowledge of the geology of Africa is not sufficient to enable us to determine its earlier history with any accuracy. Madagascar was certainly once united to the southern part of the continent, but it is clear that its separation took place before the great irruption of large animals just described. In South-temperate Africa the peculiar forms of mammalia, birds, and insects, with the wonderfully rich flora of the Cape of Good Hope, point to the former existence of an extensive south temperate land, in which so many peculiar types could have been developed.

At the time that Tropical and South Africa were so completely cut off from the great northern continent, the Peninsula of India, with Ceylon, was also isolated. Another remarkable change has taken place in Eastern Asia in Tertiary times. There can be no doubt the Sunda and Japan Islands formed southern and eastern extensions of the continent. The Philippines and Celebes, perhaps, also formed a part of this continent, but became separated earlier. Between India and Malaya and Madagascar there has been communication; but as this is proved chiefly by resemblances in birds and insects, it may be accounted for by the former existence of a western extension of India and lands in the Indian Ocean, indicated by the Laccadives, Maldives, Seychelles, and Chagos group. With reference to the existence of a Lemurian continent, Mr. Wallace considers there is no sufficient evidence to warrant such a supposition, though undoubtedly the lemurs are a type of great antiquity and wide range.

The mammalia of the Nærarctic region, or temperate North America, are not very numerous, and can for the most part be divided into two groups—one allied to the Palæarctic and the other to the Neotropical fauna. In the Neotropical region, comprising all South America and the tropical parts of the northern continent, we find that the Old World types have still further diminished, while a number of new and peculiar forms have taken their place—mammalia, birds, reptiles, &c., so that South America presents, on the whole, an assemblage of curious and beautiful natural objects, unsurpassed—perhaps even unequalled—in any other part of the globe.

There are distinct proofs that in the Post-Pliocene (corresponding nearly to the Post-Glacial period and to that of pre-historic man in Europe), the Pliocene, Miocene, and Eocene periods, the interchange of large mammalia between the Nærarctic and Palæarctic regions was far more easy than now. This interchange may have taken place either where a comparatively shallow sea now exists, between Norway, Iceland, Greenland, and Arctic America, or by way of Behring Straits. The past history of the North American fauna is complicated also by a set of migrations from South America, which occurred at the end of the Pliocene or beginning of the Post-Pliocene epoch. The remains of this epoch found in Brazilian caves show us that the fauna of South America immediately preceding that now existing was much richer in large mammalia, and probably in many other forms of life. The inter-migrations which have undoubtedly taken place between North and South America favour the notion that the two continents have developed fauna of their own, and so must have been separated by straits connecting the Pacific and Atlantic Oceans—a fact further borne out by the similarity between the mollusca of the Pacific coast and that of the Caribbean Sea. Among changes which South America has undergone, perhaps the most important has been its separation into a group of large islands—a fact shown by the immense area and low elevation of the great alluvial plains of the Orinoko, Amazon, and La Plata. A shallow strait may have then separated the highlands of Guiana and Brazil from the Andes, and the balance of land may have been restored by an elevation of the now submerged east coast for several hundred miles, embracing the Falklands, and reaching far to the south of Cape Horn.

Australia, with New Guinea (which has in recent times been united with it), is characterised by the lowly organisation of its mammalia, the marsupials, which alone prove that Australia must have remained almost or quite isolated during the whole of the Tertiary period. In the Oolite and Trias formations remains of marsupials have been found closely resembling remains of similar age in North America. At this early period immigration from the northern continent may have taken place, but there is no probability of any connection having since existed. After summing up the general conclusions regarding the former geographical distribution of sea and land in the different quarters of the globe, which a study of the present and past fauna leads us to, Mr. Wallace brought his lecture to a conclusion.

The PRESIDENT made some eulogistic remarks on the value and interest of Mr. Wallace's researches, and after noticing the presence of his Majesty the Emperor of Brazil, who had honoured the meeting with his attendance, announced the Society's meetings adjourned till the following November.

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IMPERIAL RUSSIAN GEOGRAPHICAL SOCIETY.

Monthly Meeting of April 6th (18th), 1877.

M. P. DE SEMENOF, Vice-President, in the chair.

The SECRETARY announced the death, at Vienna, two days previously, of M. Barbot de Marny, a Geologist, whose chief works were the production, in conjunction with M. de Helmersen, of a geological map of Russia in 1861; and, in 1862, a remarkable geological and orographical study on the Kalmuck Steppe, for which the Society awarded him the Gold Medal and the title of Corresponding Member. Since then M. de Marny had taken an active share in the labours of the Society, his last work being the geological examination of the Amu Daria country in 1874, the results of which he was engaged upon at the time of his death.

The most recent news respecting Colonel Prejevalsky (see our present number, p. 216) were then communicated by the Secretary.* Captain Pevtsof, who during last summer had taken various geodetic observations for a distance of 845 versts between Zaissan and the Chinese town of Guchen, and had made zoological, botanical, and mineralogical collections, was on the point of completing the account of his labours, illustrated by a map of North-west China on the scale of 40 versts to an inch.

The Society is at this moment organising two expeditions, one to make ethnological researches among the Finnish population of the Volga, and the other to explore the fluvial highways of Siberia. M. Mainof, the officer in charge of the first expedition, was to have started on the 20th May. The second or Angara Expedition has been enlarged in its scope, by M. Sibiriakof having promised a grant of 2000 roubles (in addition to 5000 roubles already given by him) towards the cost of the examination by the expedition of the water-partings between the Ob and Yenissei, in the direction of the Ket River, and between the Yenissei and Lena, by way of the Angara and Ilim Rivers. If, on investigation, it should prove practicable to unite these great water systems, the benefit that would accrue by joining the north-west confines of China with Russia in Europe by a continuous waterway would be incalculable.

Announcement was made of the formation of the Russian Committee in connection with the Belgian project for the exploration of Africa, and the names of General A. Makscheief and Baron F. d'Osten Sacken were mentioned as having been elected members.

* The two versions of the telegram are identical, with the exception of the interesting additional fact mentioned in the last, that Prejevalsky had hunted and bagged some wild camels in his sojourn in the Lob Nor country.

M. VOIEIKOF gave an account of his recent travels in Japan during the summer of 1876. He stated that there are two lines of railway in Japan, one about 20 miles long from Yokohama to Yeddo, and the other about twice that distance from Kiogo by way of Oossaka to Kioto. There are also several Japanese lines of steamships, the chief of which unites Yokohama with Nagasaki and Shanghai. These lines are in the hands of companies, who receive a large subvention from the State. There are also many small steamers which ply in the Gulf of Tartary. There are very few roads practicable for carts throughout Japan; the *jirukisha*, a small carriage drawn by a man at a pace of about five miles an hour, is a favourite mode of locomotion along fairish roads; where this is impracticable, travellers use palanquins or ride on horseback. There is a remarkable uniformity in the manners and customs of the people throughout the country, notwithstanding the size of the country, the difficulties of communication and the great dissimilarities of different provinces. The northern part of Nipon is much more scantily peopled than the southern. In the valleys, where irrigation and rice culture are practicable, the population is dense, and agriculture is very forward; but the mountains, on the other hand, are sparsely inhabited and covered with thick forests. M. Voieikof gives it as his opinion that Japanese manufactures have deteriorated since the immigration into the country of Europeans; and that as the people strive to make money quickly, their work lacks the artistic character and careful finish it formerly had. M. Voieikof furnished the society with a list of 600 barometric heights he had taken.

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ITALIAN GEOGRAPHICAL SOCIETY.

May 24th, 1877.—At this meeting Signor CORA, of Turin, held a public conference on the subject of the existing maps of Turkey in Europe, which he justly deemed at the present moment a topic of supreme interest. The best maps were, he said, those of Scheda and of Kiepert, that of the latter being the most minute and full of information—a perfect marvel of geographical labour, executed by himself alone. M. Kiepert told Signor Cora that a new edition would shortly be issued of this map, and begged that he, Signor Cora, would be so good as to afford him all possible information with regard to the Epirus, visited by the latter in 1874, and again in 1876. Signor Cora spoke of the whole peninsula with great clearness and precision; alluded to the various races, and to the chief geographical works treating of those parts. He stated that Turkey itself might be said to possess no territorial maps. He described Albania with the accuracy of one who had personally visited that province. According to Signor Cora's opinion, the chief cause of the long, interminable marches made by the Russians is this want of local charts, the many unknown places they come to, and the want of roads.

Signor Cora's discourse was very much applauded by the meeting.

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